THE UNIVERSITY OF ALBERTA

A STUDY OF THE RELATIONSHIPS BETWEEN PERCEPTION, PERSONALITY, INTELLIGENCE AND GRADE ONE READING ACHIEVEMENT

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled, "A Study of the Relationships Between Perception, Personality, Intelligence and Grade One Reading Achievement" submitted by Kathlyn Benger in partial fulfillment of the requirements for the degree of Master of Education.

ABSTRACT

The purpose of this study was to examine the relationships between visual perception, auditory discrimination, aural vocabulary, intelligence and personality with first grade reading achievement, with a view to finding a battery of tests that could be used by grade one teachers to screen potential reading problems.

Stratified samples of thirty above-and thirty below-average readers were selected by virtue of their performance on the _Gates Primary Reading Test (Type PPR)_ and the _Edmonton Public School Word Recognition Test_. Excluded from the sample were children whose retardation in reading might be due to factors other than perceptual and personality. Good and poor readers were matched according to sex, school, as near as possible to intelligence on group tests, in arithmetic ability, and in twenty-five out of the thirty pairs to grade one teachers. Individual telebinocular and audiometric screening and individual intelligence tests (_Stanford Binet_) were given. Other measures administered were _The Marianne Frostig Developmental Test of Visual Perception_, _The Wepman Auditory Discrimination Test_, _The Peabody Picture Vocabulary Test_. Teachers were instructed in the use of a five-point rating scale, on which to assess three personality traits, concentration, dominance/submissiveness and persistence.

Analysis of the data using multiple linear regression led to the findings that:

1. Aural vocabulary was not a significant factor governing success

in reading of primary children of average intelligence.

2. Although no one measure is a sufficient predictor of primary reading in itself, the strongest single predictor of primary reading was a teacher-rating for the personality trait, concentration.

3. The strongest battery of tests for prediction of primary reading achievement was a combination of The Marianne Frostig Developmental Test of Visual Perception, The Wepman Discrimination Test and a teacher-rating for concentration, rather than a combination of the visual and auditory tests with the Stanford Binet Intelligence Test.

The findings suggested the implication that by the end of grade one, a good reader has already reached a fairly complex level in both visual and auditory perception. A further implication was that personality traits, particularly concentration, exert a strong influence not only on the more complex levels of visual and auditory perception, but also on intelligence and reading achievement. It was suggested that more use be made of teachers' observations, carefully structured and recorded on rating scales.

The findings of this limited study should be tested with a larger population in which reading achievement is normally distributed. Present indications are that The Marianne Frostig Developmental Test of Visual Perception with a modification for group administration of The Wepman Auditory Discrimination Test, together with a teacher's rating for concentration, might constitute a useful battery for diagnosing areas of

perceptual and personality weaknesses leading to reading deficiency at the grade one level. These measures could be administered by primary teachers and point the way to specific and speedy remediation, and thus prevention of cumulative gross reading deficiencies.

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THE PROBLEM

It is generally acknowledged that numerous factors are involved in the achievement of reading skills at the grade one level. One of the most important of these factors appears to be the level of maturation of certain perceptual abilities. Vernon (1960) and others have attempted to determine the developmental sequence of these abilities, and efforts have been made by Wepman (1958) and Frostig (1963) to assess these abilities by means of standardized tests.

Gross deficiencies in perceptual skills have long been used as criteria for setting up special methods of instruction, for example, hard of hearing, sight-saving and cerebral-palsied classes. Minor deficiencies in perceptual skills are not usually detected by instruments at present in normal use in the classrooms of public schools. Furthermore, primary teachers do not usually have the training to ascertain the nature of reading disability at the grade one level.

Few investigations apart from Malmquist's extensive study in Sweden (1958) have been concerned with the effect of personality factors on primary reading achievement. Measures to assess personality traits are difficult to formulate, and not in general use in schools.

Much research in reading has been concerned with the relationship of one or two factors with reading achievement, often with a population of retarded readers.

This study attempted to investigate the inter-relationships of

visual and auditory perception, intelligence and personality factors, with primary reading achievement.

In order to uncover basic perceptual and personality differences which may be responsible for differences in reading achievement, the investigator worked with two stratified samples of above-and below-average readers, who were selected from the entire population of children completing their grade one year in the City of Edmonton, Alberta, Canada in June, 1965. Deliberately excluded from the sample were children whose retardation in reading might be due to factors other than perceptual and personality, for example, physical or educational factors. Perceptual tests were chosen both for their diagnostic possibilities, and for their ease in administration by classroom teachers. An aural vocabulary test was chosen that could easily and speedily be administered and scored by classroom teachers. Teachers were instructed in the use of a five-point rating scale in order that they might assess three personality traits, concentration, dominance/submissiveness and persistence.

DEFINITION OF TERMS

1. The criterion variable, reading achievement, is the sum of the combined scores of the Edmonton Public School Word Recognition Test (Revised 1961) and the Gates Primary Paragraph Reading Test (Type P.P.R.), both tests of silent reading administered by classroom teachers as part of the regular testing program at the end of the children's first year in school in June, 1965. Hereafter the

reading tests may be designated E.W.R. and P.P.R.

2. Below-average readers are those having a combined score of between 32 and 50, (a B or C rating according to local norms).
3. Above-average readers are those having a combined score of between 90 and 113, (an A but not H rating, according to local norms).
4. Scores on measures of visual and auditory perception, aural vocabulary, intelligence, ratings on personality traits and the sex of the subject are the predictor variables.
   a) Visual perception refers to the five aspects of visual perception measured by the sub-tests of the Marianne Frostig Developmental Test of Visual Perception, namely the abilities to
      i. coordinate hand and eye,
      ii. discriminate between figure and ground,
      iii. perceive constancy of shape,
      iv. perceive position in space,
      v. analyse spatial relationships.

   This test may hereafter be designated D.T.V.P.
   b) Auditory discrimination is the ability to make fine discriminations in phonemes commonly used in English speech, as measured by the Wepman Auditory Discrimination Test (Form 1). Hereafter this test may be designated W.A.D.T.
   c) Aural vocabulary is the level of understanding the spoken word, judged by their performance on the Peabody Picture Vocabulary Test (Form B), which may hereafter be referred to as P.P.V.T.
   d) Intelligence is an individual assessment measured by the Stanford Binet Test (Form L-M). This test may hereafter be designated S.B.

e) Personality-ratings refer to measures of personality traits that are rated on a five-point scale by classroom teachers.

i. Concentration, which is defined as the ability to give exclusive attention to a task, to ignore perceptual distractions, and to bring one's thoughts and efforts to bear on the matter in hand.

ii. Dominance/Submissiveness, which is defined as a continuum from aggressive, commanding influence on others to unresisting, meek tractability to the will of anyone else.

iii. Persistence, which is defined as the ability to complete a task or to overcome obstacles and surmount difficulties by a determination to succeed.

HYPOTHESES

The following research questions were posed.

I. Do above-average readers perform better than below-average readers in measures of the predictor variables, namely A) to F) visual perception, G) auditory discrimination, H) aural vocabulary, I) intelligence, J) to L) personality traits, and M) according to sex?

II. What are the relationships between the criterion variable, reading achievement and the predictor variables A) to M)?

III. What contribution does a single predictor variable make towards the prediction of the combined E.W.R. and P.P.R. scores in the presence of the other predictor variables?

IV. What contribution do pairs of predictor variables make towards the prediction of the combined E.W.R. and P.P.R. scores, in the presence of the other predictor variables?

V. What contribution do triads of predictor variables make towards

the prediction of the combined E.W.R. and P.P.R. scores, in the presence of the other predictor variables?

In an attempt to answer the research questions, null hypotheses were formulated.

Hypothesis I

There is no significant difference between the means of scores of ratings made by the group of above-average and the group of below-average readers on measures of visual and auditory perception, aural vocabulary, intelligence and personality, namely,

A) the D.T.V.P. sub-test I,
B) the D.T.V.P. sub-test II,
C) the D.T.V.P. sub-test III,
D) the D.T.V.P. sub-test IV,
E) the D.T.V.P. sub-test V,
F) the composite D.T.V.P.,
G) the W.A.D.T.,
H) the P.P.V.T.,
I) the S.B.,
J) concentration,
K) dominance/submissiveness and,
L) persistence.

Hypothesis II

There are no significant correlations between the combined E.W.R. and P.P.R. scores and measures of visual and auditory perception, aural vocabulary, intelligence, personality and sex of subject, namely,

A) the D.T.V.P. sub-test I,
B) the D.T.V.P. sub-test II,
C) the D.T.V.P. sub-test III,
D) the D.T.V.P. sub-test IV,
E) the D.T.V.P. sub-test V,
F) the composite D.T.V.P.,
G) the W.A.D.T.,
H) the P.P.V.T.,
I) the S.B.,
J) concentration,
K) dominance/submissiveness,
L) persistence and,
M) sex of subject.

Hypothesis III

There is no contribution to the prediction of the combined E.W.R. and P.P.R. reading score, over and above the remaining variables still retained in the model, by restricting in turn,

A) the composite D.T.V.P. score,
B) the W.A.D.T. score,
C) the S.B. score, and finally,
D) the concentration rating.

Hypothesis IV

There is no contribution to the prediction of the combined E.W.R. and P.P.R. reading score, over and above the remaining variables still retained in the model, by restricting in turn, the following pairs of predictors,

A) the composite D.T.V.P. and W.A.D.T. scores,
B) the composite D.T.V.P. and S.B. scores,
C) the composite D.T.V.P. score and the concentration rating,
D) the W.A.D.T. and S.B. scores,
E) the W.A.D.T. score and the concentration rating.

Hypothesis V

There is no contribution to the prediction of the combined E.W.R. and P.P.R. reading score by restricting in turn, over and above the variable still retained in the model, the following triads of predictor variables:

A) the composite D.T.V.P., W.A.D.T. and S.B. scores,
B) the composite D.T.V.P. and W.A.D.T. scores with the concentration rating,
C) the W.A.D.T. and S.B. scores with the concentration rating.

DESIGN OF THE STUDY

Population and Sample to be Used

Two stratified groups of thirty above and thirty below-average readers were selected from the entire population of children completing their grade one year in the public schools of the City of Edmonton,

Alberta, Canada. The method of selection, to be fully discussed in Chapter III, aimed at eliminating as far as possible physical, intellectual, home, emotional and educational factors, which might help to cause reading disability, but which were not under investigation in this study.

1. Selection of the sixty subjects was accomplished by examining class record forms completed by grade one classroom teachers, and individual cumulative records, and by individual audiometric and telebinocular screening of potential subjects by the investigator in September, 1965.
2. Following the selection of the sixty subjects, the measures of
    a) visual perception,
    b) auditory discrimination, and
    c) aural vocabulary were obtained by the investigator in October, 1965, together with measures of
    d) intelligence by graduate students of the Division of Educational Psychology from the University of Alberta, in November, 1965 and
    e) personality traits by classroom teachers after structured observation from September to November, 1965.
3. All data were punched on IBM cards and programmed by the computing centre at the University of Alberta. A statistical analysis of the data was then made by the investigator in an attempt to seek answers to the research questions.

LIMITATIONS OF THE STUDY

1. The design of the study required that selection of the subjects be made from group measures of silent reading. It is recognized that individual oral reading tests might afford a more accurate measure, particularly in word attack, at the primary level, but this was not possible in the present experiment.
2. The population was limited because of time spent in individual testing to sixty subjects in the average range of intelligence. Further limitations to the population are enumerated in detail in Chapter III.

THE NEED FOR THIS STUDY

It was hoped that this study would uncover basic perceptual and personality differences which might help to explain why, among primary children with apparently similar intellectual and physical assets, some learn to read quickly while others lag behind.

Perceptual, aural vocabulary and personality measures were used that primary teachers could be trained to employ.

If the findings of this pilot study with above and below-average readers prove significant, it is hoped that further research will be conducted with a normal population of primary grade children, with a view to pointing the way to early diagnosis and remediation of reading deficiencies by classroom teachers.

CHAPTER II

A REVIEW OF RELATED LITERATURE AND RESEARCH

Many leading investigators, (Malmquist, 1958, p.25; Strang, 1964, p.22) testify that the nature of reading disability is extremely complex, and only rarely due to a single causal factor. Usually a whole complex of factors are at interplay with each other, and the degrees of relationship may vary. Often there is no clear line of demarcation between which are causes and which are effects of reading failure. Factors which may be operating in reading achievement belong to four broad areas, physical, mental, environmental, (the school and the home), and emotional. (Bond and Tinker, 1957, p.12) Many investigators in the past have studied the relationship of one factor with reading. Few have probed the simultaneous inter-relationship of several factors with reading achievement.

During the last forty years a trend has emerged of reading research designed with a view towards diagnosis of practical use to classroom teachers. (Bradshaw, 1963) Two suggestions pertinent to diagnosis appear in the literature. First, diagnosis of reading difficulties shall be made as early as possible, for failure to read often produces adverse social and emotional effects, which may compound with the reading disability to form a severe problem. Bond and Tinker (1952, p.34) when following up the records of fifty children who had received diagnosis and treatment at the University of Pennsylvania Reading Clinic noticed that the younger children, (eight to eleven years) made and

maintained significantly greater progress after remedial reading instruction than the older children, (thirteen to sixteen years). Vernon (1958) states:

> Cases are rarely recognized when their inability to learn to read is in its early stages. By the time they are detected and studied, the original causes may have been overlaid and concealed by a whole tissue of confused cognitive processes [and] emotional resistances. (p.7)

This early detection of reading problems may best be accomplished by classroom teachers. Bond and Tinker (1957) suggest that the "diagnosis of reading difficulties is an essential part of classroom instruction," (p.125) and that teachers should be increasingly watchful for physical and sensory limitations. Furthermore, by adjusting methods and materials to cater to individual differences, they can cope with milder degrees of reading difficulty before they become serious deficiencies.

The problem then becomes: What are the guidelines a teacher may use at the primary level to help her detect and correct reading difficulty?

Forty years ago, it was almost universally held that a child's reading achievement depended on his chronological age, -- he learnt to read his first year in school. An increasing number of reading failures in primary grades led to the formation of another criterion for reading success, that of mental age. A child was judged ready to read when he attained the mental age of six and a half years. As classroom teachers have neither the time nor the training to administer individual intelligence tests to each of their class, they must turn to group intelligence

tests in order to measure mental age.

Flatham, (1965) investigating predictors contributing to achievement in reading of 520 grade one children in the Edmonton Public School Board System, found that intelligence, (as measured by the Detroit Beginning First Grade Intelligence Test), age, socio-economic status, sex and attendance at play-school or kindergarten, combined to produce only thirty per cent of the variance. He attributes the remaining seventy per cent of the variance to "a whole array of other affective and cognitive variables." (p.7)

It seems then that chronological and mental age are not sufficient in themselves to predict reading achievement, and that teachers must use additional criteria. Hildreth (1950) suggests the use of "a general readiness test ... with a good intelligence test ... to increase the accuracy of measurement in predicting pupil progress." (p.80) A recent researcher at the University of Alberta, (Romaniuk, 1964) investigated the predictive power of the Metropolitan Readiness Test for end-of-grade one achievement, using a population of 444 technically under-age children, who are now part of the Edmonton Public School System. Correlations between Metropolitan Readiness Test Scores and actual achievement were in the order of .595. The single predictor and criterion measure accounting for the greatest portion of variance common to both readiness and criterion batteries were the Metropolitan Number Sub-Test and predictor and the Edmonton Public School Board Achievement Test in Arithmetic (Grade I). Flathman (1965) made a similar discovery, that correlations between Detroit Intelligence scores and arithmetic

achievement were higher than those between Detroit Intelligence scores and reading achievement scores. Apparently the two common yardsticks to predict end-of-grade one success both correlate higher with arithmetic achievement than they do with reading!

PERCEPTION AND READING

Many educators have noticed that the intelligent child is not always a successful reader and have been at a loss to explain why a child who appears to have the intellectual potential for learning to read should make relatively slow progress in acquiring the necessary skills.

Austin (1961) made a detailed study of many factors associated with reading under-achievement, at the grade three level. She investigated factors within the child, such as his intelligence, his personality, his health and his home-background, together with factors within the teaching situation such as the quality of instruction and materials used by the classroom teacher. A population of 156 children were selected in grouped triads, who were close together in group intelligence scores. Each triad consisted of a high, average, and a low reader by virtue of his performance on the Paragraph Meaning Sub-Test of the Stanford Achievement Test. Each child was then given the Wechsler Intelligence Scale for Children, individual audiometric and telebinocular screening, together with many individual reading and phonics tests, in addition to the obtaining of data from home visits and teacher-and-home information questionnaires. Results showed that general verbal intelligence accounted for not more than thirty-five per cent of the observed

variance in reading ability, implying that many other factors are at work besides intelligence in determining reading achievement. Austin found evidence of "a special disability ... in learning to associate sounds with orthographic symbols. This disability is to a considerable extent independent of intelligence and general verbal ability." (p.151) She indicates further research is needed into the nature of this disability.

What processes are actually involved before a child can make the successful sound-symbol link mentioned by Austin? A review of the literature revealed the following descriptions: "In order to read a little word like 'hat', a sequence of letters seen, a sequence in space has to be translated into a sequence of sounds heard, a sequence in time." (De Hirsch, 1957, p.567) Vernon (1958) has written:

> He [the child] has first to learn to perceive and remember the word sounds accurately, as spoken in a 'standard English' accent, which may necessitate an accuracy of hearing and an effort of attention quite beyond his capacities. He must then realize that the whole sound of the word can be analysed into successive phonetic units which are associated with the printed shapes of letters and letter groups ... (p.44)

Diack (1960) mentions:

> A child must have familiarity with letters and the common sound-meanings -- to visualize how a word not previously seen in print would look ... When the only information reaching the brain is through the eye, visual analysis takes place, but when suitable supplementary information also reaches the brain, the act of perception may be speeded up ... The information through the ear must not be false. (p.80)

Bryant (1962) voices the same opinion. "Since an immediate feedback of sound association improves visual perception, the lack of symbol-

sound association for letters and word-parts contributes to perceptual errors." (p.286) Money (1962) also states that a reading vocabulary is acquired "through a feat of visual inventory memory helped by an auditory phonic system." (p.22)

It would appear then from a review of the literature that a child's powers of perception are involved in beginning reading, and in particular, his visual and auditory perception. Listing four necessary requisites for primary reading achievement, Sister Nila (1953, p.548) enumerates in order of priority:

1) auditory discrimination
2) visual discrimination
3) range of information
4) mental age

Durrell and his co-workers have shown much interest in the respective roles that visual and auditory discrimination and mental age play in the determination of initial reading success. They report that the knowledge of letters and the ability to identify sounds in words are more closely related to growth in word-recognition than are intelligence scores. (Durrell, 1958, p.24) Commenting on this, Strang (1964) suggests:

> Skill in such a relatively simple process as associating the visual perception of a word with the spoken word may be determined more by previous experience in visual and auditory discrimination than by intelligence. As making sound-symbol associations becomes subordinate to comprehending sentences and paragraphs, the need for intelligence becomes greater. (p.216)

Sister Mary James Harrington (1955, p.80) administered tests to

500 primary children in Boston. First, the children were matched according to mental age, phonic ability and visual discrimination, but one child in each pair was superior in auditory discrimination. It was found that by the end of the second grade, superiority in auditory discrimination resulted in a mean difference of eighteen words on the reading vocabulary test used. In the second part of the experiment, the children were matched for auditory discrimination, phonic ability and mental age, but this time with one of each pair better in visual discrimination. This visual superiority resulted in a mean difference of thirty-two words at the end of the second grade. In the third section of the experiment, the children were equated except for phonic ability. Superiority in phonics led to a mean difference of thirty-three words. Surprisingly enough, a mental age difference of a year and a half only resulted in a mean difference of three words in reading vocabulary. The exceptionally low correlation (.23) of mental age with reading achievement may perhaps be due to the type of intelligence test used. The Otis Quick Scoring Mental Abilities Test Alpha (Form A) is a group measure mainly of oral language comprehension, and does not test many of the visual discrimination skills such as would be measured in a test of the Detroit Beginning First Grade Intelligence Test type.

Harrington suggests that most children entering grade one have reached the necessary level in listening and speaking vocabulary for success in beginning reading. To acquire a reading vocabulary however, the children require skill in both visual and auditory discrimination and phonics.

Researchers under Durrell have investigated the value of specific training in visual and auditory discrimination for primary grade children.

For her Master's thesis in 1940, Murphy worked with 150 children who were having difficulty in grade one reading. She divided them into three groups on the basis of intelligence and learning rate. Fifty children were given visual discrimination exercises, fifty had ear-training activities for ten minutes each day for six weeks, while the remaining fifty continued with their regular classroom work. At the end of the training period, both experimental groups had doubled their capacity to retain words, while the control group had only increased theirs slightly.

To complete requirements for a further degree, Murphy (1943) selected a larger sample of 540 pupils from thirteen classrooms dividing them this time into four groups matched for mental age, learning rate, speaking vocabulary and auditory discrimination ability. One group was given visual discrimination training, a second ear-training, a third a combination of visual and auditory training, while the fourth group worked as usual on classroom activities. All training periods were limited to ten minutes a day as part of the regular reading-period time-allotment. Gains made by the combined visual and auditory training group were superior to either of the other experimental groups. Children with initially high auditory ability gained little from the exercises, but children with poor auditory discrimination made significant improvement. This study has limited value as the training period was of very short duration, only six weeks.

Summarizing four studies involving more than 2,000 first grade children, Durrell himself (1958) points out that some forms of discrimination training with grade one children have limited value. He cites particularly certain types of visual discrimination training:

> All children were able to match capital letters as well as lower case letters. Exercises in this ability should be omitted from reading readiness materials. It appears to follow that matching of non-word forms and pictures as preliminary instruction for letter and word perception is relatively useless. (p.5)

The Development of Visual Perception

It appears advisable then to examine the development of perception in a child, in order to determine approximately what levels of perception he may have reached during his first year in school. Researchers are greatly indebted to Piaget who, through his detailed observations of children, has shown how perception gradually develops. A young child first learns through actively exploring, doing things for himself, touching, tasting, moving. Birch (in ed. Money, 1961) has hypothesized that at this stage auditory and visual stimuli "constitute background rather than figure in the organization of the response." ....[Gradually].... "the teleoreceptor systems come to dominate over visceral and proximal receptions" (p.163) until finally behaviour patterning is organized mainly from information -- input through eyes and ears with other sensory processes now acting as background instead of figure. As the child grows older, behavioural patterns become increasingly complex, as he learns to cope with increasingly more differentiated and highly integrated organizations. (De Hirsch, 1957, p.567) So, it is some time

before the child begins to perceive things that may be of educational importance, such as details of shape, pattern, arrangement and number. (Vernon, 1960, p.5) Even when he is quite small, however, a visual experience begins to take pre-dominance over a haptic. Frostig (1965, p.579) points out that if a child is shown an object visually, then asked to feel it without looking at it, and finally asked to describe it, his description will almost invariably be in visual terms.

Vernon (1958, p.30) suggests that visual perception matures rapidly by age five or six, so that by the time a normal child enters school, he has already had much visual experience. From the age of two he has been able to pick out a simple shape such as a square, a circle or a triangle. (Gellerman, 1933) At four, a child of average intelligence can match eight out of the ten outline shapes in one of the Terman-Merrill test items. (Terman and Merrill, 1937) He cannot usually copy a circle and a square correctly before the age of four, a triangle before five, and a diamond before six. (Piaget and Inhelder, 1956)

It seems from the foregoing evidence that by the time most children come to school they have already developed the ability to perceive simple shapes visually, and indeed Gates (1922) and Kendall (1948) have shown that there appears to be little or no relationship between the ability to perceive shapes visually and to learn to read. When shapes are more complicated, with several parts or with interior detail, accurate perception is slower to develop. Several researchers, Bender (1938), Piaget and Inhelder (1956) and Gesell and Ames (1946), have all found that under the age of six or seven, a child cannot grasp

the relationship between the parts of a complex figure:

> He may remember the outline or some of the parts separately, but not understand the manner in which these are fitted together. So a child beginning to read may notice the length of the word or certain letters, without remembering exactly the shapes of any letter, nor all the letters in the word, nor the relationship in which the letters occur. (Vernon, 1960, p.5)

Piaget (1960) has also pointed out that children tend to see things as part of a total situation from which they cannot be isolated. Thus, children find it difficult to attend to the significant features and ignore the less relevant. A recording of younger children's eye movements show that younger children's gaze tends to wander all over figures, while that of older children more often fix on points of particular importance.

Vernon (1960, p.6) reports an interesting experiment performed by Ghent (1956), who found that no child before the age of six could superimpose a simple figure on a complex one as in the figure.

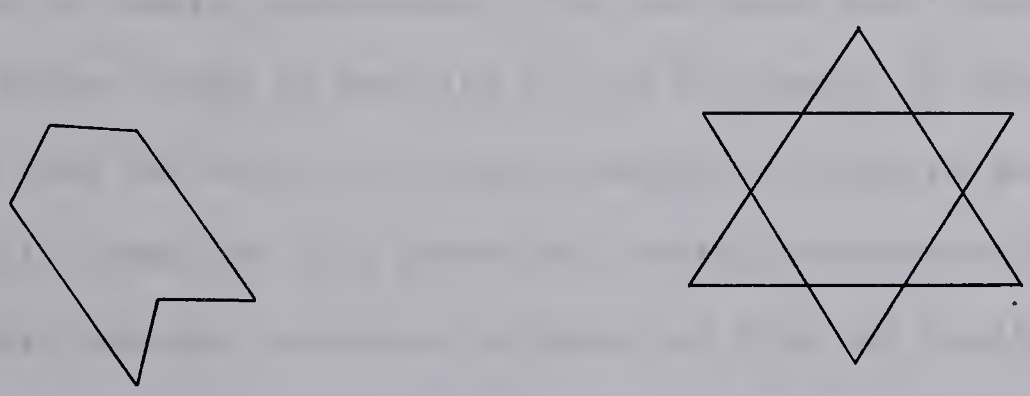


FIGURE 1

SUPERIMPOSING A SIMPLE FIGURE ON A COMPLEX ONE AFTER GHENT (1956)

It seems as though there may be different levels of perception. Birch (ed. Money, 1961), through clinical research with hemiplegic adults and neurologically damaged children, has suggested that there may be an early level of perceptual discrimination, followed by a later level of perceptual analysis, and finally by a level of perceptual synthesis. Perhaps "inadequate development on one of these higher and more complex levels of visual perceptual functions" (p.168) may lead to reading disability. Birch is now examing this hypothesis that defective analytic and synthetic visual perceptual capacity relates to reading disability with normal and abnormal children.

Goins (1957), adapting some unpublished visual perception tests of Thurstone's, explored the relationship between the visual perceptual abilities and reading achievement of 120 grade one children. She found substantial correlations and that measures of strength of closure, an ability to keep in mind a configuration against distraction, were better predictors of reading achievement than two group intelligence tests.

A recent study by Wheatley at the University of Alberta (1965) disclosed that the ability to note reversals in letters and words is most closely connected with grade one reading achievement with a lesser relationship between reversals in geometric form and reading. Using six form and six symbol-discrimination tests of her own devising on 102 first grade children, she found positive correlations (.23 to .45) between visual perception and reading, but of insufficient magnitude to act as predictors. Wheatley concludes that the ability to note minute details is important in beginning reading. Since all of her subjects

who performed well on the visual perceptual tests did not all score high on the reading achievement tests, Wheatley (1965) infers:

> Other factors affected the performance of these pupils. Auditory discrimination may have been one inhibiting factor, while motivation or intelligence may have been factors contributing to an improved performance on the reading tests. (p.86)

Malmquist (1958) used a bigger grade one population (365 children) and investigated the relationship of other factors as well as visual to reading achievement. Using both visual form and symbol-discrimination tests constructed by himself and Engwall, he found correlations of approximately the same magnitude as Wheatley. Malmquist (1958) considers that his results confirm the opinions expressed by Gates (1926, p.436) that "perception is not an unitary function or capacity which operates uniformly for all kinds of data .... [but] is, to a great extent, specialized and varies with different kinds of material." (p.277) Noting the limitations of his study, he enumerates the variables possibly connected to reading disability that he did not investigate, namely, "auditory perception, auditory memory span, speaking vocabulary and teaching methods." (p.390)

Barrett (1965, p.282) reaches a similar conclusion to those expressed by Wheatley and Malmquist.

Barrett conducted a well-designed and extensive study to investigate the relationships and the predictive value of nine reading readiness factors, (seven requiring varying types of visual discrimination, together with chronological age and a group intelligence test) to reading achievement, as measured by the <u>Gates Primary Word Recognition</u> and

Gates Primary Paragraph Reading Tests. By using the method of multiple regression for his statistical analysis, he was able to show that the nine independent variables in the study accounted for from forty-six to fifty per cent of the variance in word recognition and from thirty-six to forty-four per cent of the variance in paragraph reading. He concludes that the factors he investigated "do not provide enough predictive precision to warrant their use alone in predicting first grade reading achievement," and that

> Visual discrimination information must be supplemented through observation and evaluation of strengths displayed .... in other .... areas, for example auditory discrimination, language facility, story sense, and understanding of what reading is. (pp.280-1)

Frostig has spent several years working at her School of Educational Therapy with children exhibiting a wide variety of learning difficulties. She noticed that several children were at first retarded in certain perceptual areas, but that with training they often acquired the perceptual skills they had previously lacked. It was necessary to detect and categorize these perceptual impairments. She and her staff found that perceptual tests such as the Bender-Gestalt or the Kohs block sub-test from the Wechsler Intelligence Scale for Children, or perceptual sub-tests from many group intelligence tests could only serve as general indicators. "No group test could be found that would allow differential screening of perceptual dysfunctioning at an early age." (Frostig et al, 1961, p.384) In order to discover deviation from the norm, it was first essential to map the normal growth of perception. Her years of clinical observation, reinforced by the findings of others such as Thurstone (1944) and Cruickshank (1957), led her to believe that certain areas of

perception could be delineated, which were critical for the acquisition of school learning, and in which development took place relatively independently of each other. The five areas selected for investigation were:

1) eye-motor coordination
2) figure-ground relationships
3) constancy of form
4) position in space
5) spatial relationships

These visual perceptual abilities were not considered to be the only ones involved in the total process of visual perception, but it was hypothesized that they were important ones in the process, particularly in school achievement. Test construction, revision and standardization occupied a number of years. Preliminary evidence indicates that "maximum perceptual development in the areas measured occurs between the ages of four and seven with less growth after the age of approximately seven and one-half." (Frostig, 1964, p.467) The size of the sub-test correlations tends to decrease with advancing age. Frostig conjectures that this may be due to "progressive differentiation of perceptual ability" (p.486) and would fit in the theories advanced by Werner (1957), De Hirsch (1957) and Birch (ed. Money, 1961), that "development of mental functions proceeds with increasing differentiation and progressing hierarchization." (Frostig, 1964, p.186).

Bryan (1964, pp.44-48) has recently used the Frostig Developmental Test of Visual Perception to determine the relative importance of visual

perception and intelligence in the reading development of children from kindergarten to grade four. In conjunction with the Frostig Test, he administered the Kuhlman-Anderson Intelligence Test, The Metropolitan Reading Readiness to kindergarten and first grade, and the California Achievement Test to grades one, two and three. Results indicated that at first grade level, visual perception appears more closely related to reading success than do intelligence and readiness. (.50 to .51 at the .01 level.) In grade three, intelligence scores were better predictors of reading success. Conclusions must be guarded from Bryan's limited sample from one school, but his findings suggest the need to test visual perception at the kindergarten and grade one level in addition to the testing of intelligence and reading readiness.

At this point it seems advisable to summarize the evidence from related literature and research on the relationship between visual perception and primary grade reading achievement.

1) Many investigators have studied the role of visual perception in reading success, but much research remains to be done.

2) Visual perceptual ability appears to have a significant relationship with primary reading achievement, perhaps more than intelligence does.

3) Visual perception is not a general ability but rather consists of specialized areas, which vary according to the type of material which is to be perceived.

4) Visual perception is developmental. Different levels of development may be present in different areas of specialization. By the

time a child comes to school, he has usually had sufficient visual experience in recognizing simple geometric forms, letters and symbols. He may have difficulty at the more complex levels of perception, those of analysis and synthesis, where he must perceive small details in letter shapes, understand the importance of their spatial position, and the relationship of one letter to another in the total word shape. Increasing complexity of perception, for example longer verbal units, call for increasing organization of perception from him.

5) Other factors, besides visual perception contribute to success in beginning reading. Auditory discrimination is mentioned by several investigators.

The Development of Auditory Perception

A much less extensive body of research exists on auditory perception, particularly as it applies to primary reading.

It is commonly surmised that if a child can hear properly, he can understand what is said to him, and that as soon as he understands the spoken word, he will be able to discriminate each sound within that word, a necessary requisite before he can either speak correctly himself, or attack new words through phonics.

Wepman (1960) perhaps the foremost investigator in this field, suggests from his extensive clinical experience and experimentation that auditory perception is not a unitary function. He describes three different areas or levels each of which develops sequentially, and within itself:

> First to develop is acuity. This is the ability of the ear to collect sounds from the environment and transmit them to the nervous system.
>
> Second is understanding -- the ability of the central nervous system to extract and interpret meaning from the patterns transmitted to it, patterns that in this instance originate aurally.
>
> Next to develop is the level of discrimination and retention, the abilities that permit the individual to differentiate each sound from every other sound and to hold each in mind well enough and long enough for the individual to moderate his speech and make phonic comparisons. (p.327)

From the point of view of reading, all these perceptual levels are important. The basis from which good auditory perception starts is acuity or degree of freedom from auditory defects. Vernon (1958, p.33) cites evidence that the acuity of six-year-old children may be lower than that of eight-year-old children. Wepman (1961, pp.245-247) however mentions that good hearing is not automatic but merely "an alerting response," and that a young child must learn how to listen. The present investigator is aware from her own clinical experience that the accuracy of individual audiometric testing of six-year-old children may be distorted through lack of attention.

Vernon (1960, p.10) has described how a young child gathers meaning from his mother's gestures and the emotional overtones present in the inflection of her voice before the phonetic pattern. He hears speech in sound-patterns or 'gestaltqualitat,' wholes, which convey to him complete instructions or statements. Particularly at first is it difficult for him to isolate the meaning of a word from the rest of the sentence, because it is embedded too deeply in its context. By the age of five however, Watts (in Vernon, 1960, p.8) estimates that an average

child understands around 2,000 words, and two years later between 4,000 and 5,000.

In order to be able to speak correctly, a child must not only be able to understand the meaning of a word, but he must be able to hear its exact phonetic pattern. Very early in life a baby is able to react to gross differences in sound. As he develops he gradually becomes capable of making finer and finer discriminations. Wepman (1960) found from clinical experience that "some children do not develop the ability to make fine aural discriminations until they reach the age of seven or eight." (p.328)

Before he can read properly, a child must go a step farther. He must be able to isolate the individual letter-sounds from the word-sound. The meaning of the word will probably be familiar to him, but the isolated letter-sounds have no intrinsic meaning. He must now venture into a second symbolic system by attaching the letter sounds to the printed letter shapes, re-synthesize them together into a printed word and then recall the familiar aural meaning of that word.

Unfortunately in the English language, vowels have many sounds, and it may be that the child cannot decide which is the correct one, until he has sounded out the entire word. It is not surprising that most children under a mental age of seven are incapable of the systematic analysing and synthesizing required in phonetic attack of words. (Vernon, 1958, p.45)

Wepman reached a similar conclusion, that children are often unable to make fine discriminations in sound before their eighth year,

and to test his hypothesis gained from clinical experience, he devised an Auditory Discrimination Test, which was tried out in different studies (Wepman, 1960), and then standardized. He found that, with intelligence held constant, around twenty-seven per cent of eighty children in grade one showed inadequate auditory discrimination and had reading scores significantly below the level of children with satisfactory auditory discrimination. In grade two, only nineteen per cent showed a similar correlation.

Wepman (1960) then developed an auditory discrimination theory:

> 1. There is evidence that the more nearly alike two phonemes are in phonetic structure, the more likely they are to be misinterpreted.
>
> 2. Individuals differ in their ability to discriminate among sounds.
>
> 3. The ability to discriminate frequently matures as late as the end of the child's eighth year.
>
> 4. There is a strong positive relation between slow development of auditory discrimination and inaccurate pronunciation.
>
> 5. There is a positive relation between poor discrimination and poor reading.
>
> 6. While poor discrimination may be at the root of both speech and reading difficulties, it often affects only reading or speaking.
>
> 7. There is little if any relation between the development of auditory discrimination and intelligence as measured by most intelligence tests. (p.326)

It seems then that grades one and two are vital years for growth in auditory discrimination, a necessary attribute for successful reading. The following investigators furnish additional proof of the growth that takes place during these formative years.

An investigator at the University of Alberta, Reid (1962) tested the auditory abilities of 112 children, the entire first grade of a school in October and May and related them to the oral and silent reading scores at the end of grade one. Although she found that auditory memory was generally significant in its relationship to reading achievement, auditory discrimination sometimes failed to reach significance. However, growth in both auditory discrimination and auditory memory was observed. Reid notes the need for further study in perceptual testing at the first grade level. She suggests that visual and kinaesthetic in addition to auditory aptitude tests be developed in order to diagnose perceptual strengths and weaknesses at the grade one level.

Dechant (1961, pp.101-102) reviews three studies all displaying growth in sound-discrimination during the grade one year. Olson (1958) with a population of 1,172 found that September tests measuring knowledge of letter names predicted February success in reading better than mental age, but that February tests of various phonic abilities showed highest correlations with reading achievements. Gavel (1958) studied 1,506 first grade children. September tests that showed a correlation of less than .50 with June reading tests were intelligence, mental age, ability to give the sound in letters, identification of words shown, identification of sounds in words, and matching of letters. February tests that predicted June reading achievement with correlations higher than .60 included "hearing of sounds in words, applied phonics and the ability to give the sound of lower case letters." (Dechant, 1961, p.102)

Lineham (1958) chose an experimental group of 314 pupils and a

control group of 300 both by random selection. Pre-tests however showed the control group to be slightly superior in mental age, learning rate and letter knowledge. The experimental group were given phonic training as soon as they had mastered the letter-names. On tests both in the middle and end of the year. The experimental group were superior in oral reading, silent reading, applied phonics, hearing sounds in words, and in tests of letter knowledge.

A review of the literature and the small amount of research on the relationship between auditory perception and reading at the primary grade level yields the following summary:

1) Not many investigators have studied the relationship of auditory discrimination to primary reading achievement. Much research remains to be done.

2) Auditory discrimination appears to be significantly related to language ability, and related, though not as strongly, to primary reading achievement.

3) Like visual perception, auditory perception appears to be developmental. One of the levels is auditory discrimination, which within itself follows a sequential development.

4) Controlled research is needed at every level of auditory perception in order to map its development.

5) Testing of auditory perception is difficult at the primary school age, because of the need for the child's attention.

6) More and better auditory testing instruments are needed.

PERSONALITY, PERCEPTION AND READING

Many investigators have studied the relationship of personality to reading deficiency. Personality defects have been judged to be causes, effects or concomitants of reading disability.

Dechant (1964) notes that research tends to show "that most children come to school with rather well-adjusted personalities," (p.64) but reading retardation in the first two grades may bring "less satisfactory personal and social adjustment." (Sornson, 1950)

Strang (1955, pp.596-599) considers that the perception of the printed page depends on many conditions both within the child and within the reading situation. She makes special reference to his attitudes, his mental alertness and his goals for the future. According to Munn (1938) in Stauffer (1947, pp.427-433), personality development is dependent on "the integration of an individual's development of vision, hearing, motor skills, memory, language and emotional reactions as they are engaged in the activities of seeing, listening, writing, recalling and speaking." If this is true, lack of development in visual or auditory discrimination might lead to personality defects. Frostig (1963, pp.160-162) has postulated that a child with visual perception deficiencies might have personality problems in grade one.

Piaget (1962) has stated that emotion and intelligence are interwoven both as causes and conditions influencing reading development:

> There are no acts of intelligence, even of practical intelligence without interest at the point of departure, and affective regulations during the entire course of action, without joy at success, or sorrow

> at failure. Likewise at the perceptual level we have affective regulations. What we perceive is a function of attention regulation, which is .... motivation by needs and interests. (p.130)

The Role of Attention in Visual Perception

Goins (1958) in her study of visual perceptual abilities related to primary reading, isolated a factor, the strength of closure, which she has defined as "the ability to keep in mind a configuration against distraction." (p.16) The types of tests disclosing the presence of this factor were Pattern Completion, Pattern Copying, Figures and Reversals. The present investigator has noticed similarities between these tests, and those used by Malmquist (1958), Wheatley (1964) and Frostig (1964).

Vernon has hypothesized that with increasing complexity of perceptual patterns, more cognitive ability is required. Attention, too, appears to be particularly pertinent to Goins' 'strength of closure' factor. Vernon reports that Witkin (1960) has produced data to show that:

> The ability to re-structure, what is presented by analysing it and extracting particular parts is a function not only of age and intelligence and attention, but also of certain qualities of personality. He considers that children who are in themselves self-reliant, and able to act on their own initiative are more capable of such tasks than are children who tend to rely passively on external circumstances or depend on others. (in Vernon, 1960, p.6)

The Role of Attention in Auditory Perception

Attention appears to play an increasingly important role at each level of auditory perception. As was mentioned earlier Wepman (1961,

pp.245-257) pointed out that hearing is only "an alerting response, ... an appropriate response to an effective stimulus." At the next stage, that of comprehension where the child must recognize the total meaning or gestalt of the sound pattern, attention is surely involved. "Pattern-making means the capacity to relate this information in terms of significance to past and present behaviour," says Hardy (in ed. Money, 1963, p.173). To do this a child must have memory and recall, but "fleeting attention, perseveration and not listening may all show behaviourally as inappropriate responses to sound without at all reflecting a lack of audition." (ed. Money, 1963, p.174) At the final level, that of auditory discrimination, a child in order to differentiate between two sounds must be able not only to extract the particular sounds from the complete sound-pattern, but be able to hold them in mind to compare one against another. As Vernon (1958) so aptly puts it, "failure of attention would particularly affect auditory perception and memory, since auditory stimuli, once lost, are gone forever." (p.61)

It seems apparent that auditory perception, and in particular auditory discrimination, require "an effort of attention" (Vernon, 1958, p.44) which some grade one and two children may not be able to give.

Only one study was found where personality variables were investigated along with other factors in their relationship to primary reading achievement. Malmquist (1958, p.190), with 399 grade one children, obtained measures on different qualities of personality by means of teachers' ratings. He found a statistically significant

correlation at the .01 level between reading ability and the following personality variables; intelligence (.584), concentration (.469), persistence (.353), self-confidence (.304) and dominance/submissiveness (.302).

Summary

It has long been considered that many factors, both within the child and within his environment, contribute to reading retardation. Much work has been done on the relationships of one or two factors with reading achievement, but few researchers have probed the simultaneous inter-relationships of several factors with reading success.

Evidence suggests that at the grade one level, the prime factor in the reading process is that of word-recognition, although the role of comprehension becomes increasingly more important towards the third grade, as the child understands progressively longer units of sentences and paragraphs. It is therefore conjectured a child's powers of visual and auditory perception might be more important than his intelligence for success in beginning reading. Investigators have also indicated the need to test perceptual aptitudes in order to diagnose and plan remediation of reading deficiencies in word recognition.

A survey of the literature leads to the conclusion that perception is not a unitary ability, but rather composed of specialized areas which might be arranged in hierarchical levels of increasing complexity. It might be further conjectured that a good reader, even at the primary level, should have progressed towards a fairly intricate level of both

visual and auditory perception. In order to identify relevant details within letters or words, he should have already reached the stages of visual analysis and synthesis suggested by Birch (ed. Money, 1961, p.168). Furthermore, in order to retain the results of his efforts in visual analysis and synthesis, a necessary quality to ensure success might be that of strength of closure, where the look of letters and words are held against the distraction of irrelevant visual stimuli. It was hoped that the sub-tests of the Marianne Frostig Developmental Test of Visual Perception would provide evidence of differentiation of development, particularly within the levels of visual analysis and synthesis, and of the capacity for strength of visual closure.

As with visual perception, it appears that auditory perception, rather than being unitary, is composed of different areas. Wepman (1960, p.327) has defined three, namely, auditory acuity, auditory understanding and finally, auditory discrimination and retention, each of which may develop independently of the others, and each of which may contribute to success in reading. It could be postulated that as with visual perception, there might be levels of auditory analysis and synthesis. In the present study, preliminary audiometric screening obviated the need to consider auditory acuity as a factor in reading disability. Evidence suggests that most children possess a reasonably adequate aural vocabulary when they enter school, but it was hoped to ascertain whether there was a difference in this area between good and poor readers by the use of the Peabody Picture Vocabulary Test.

Towards the end of the grade one year, when a child begins to

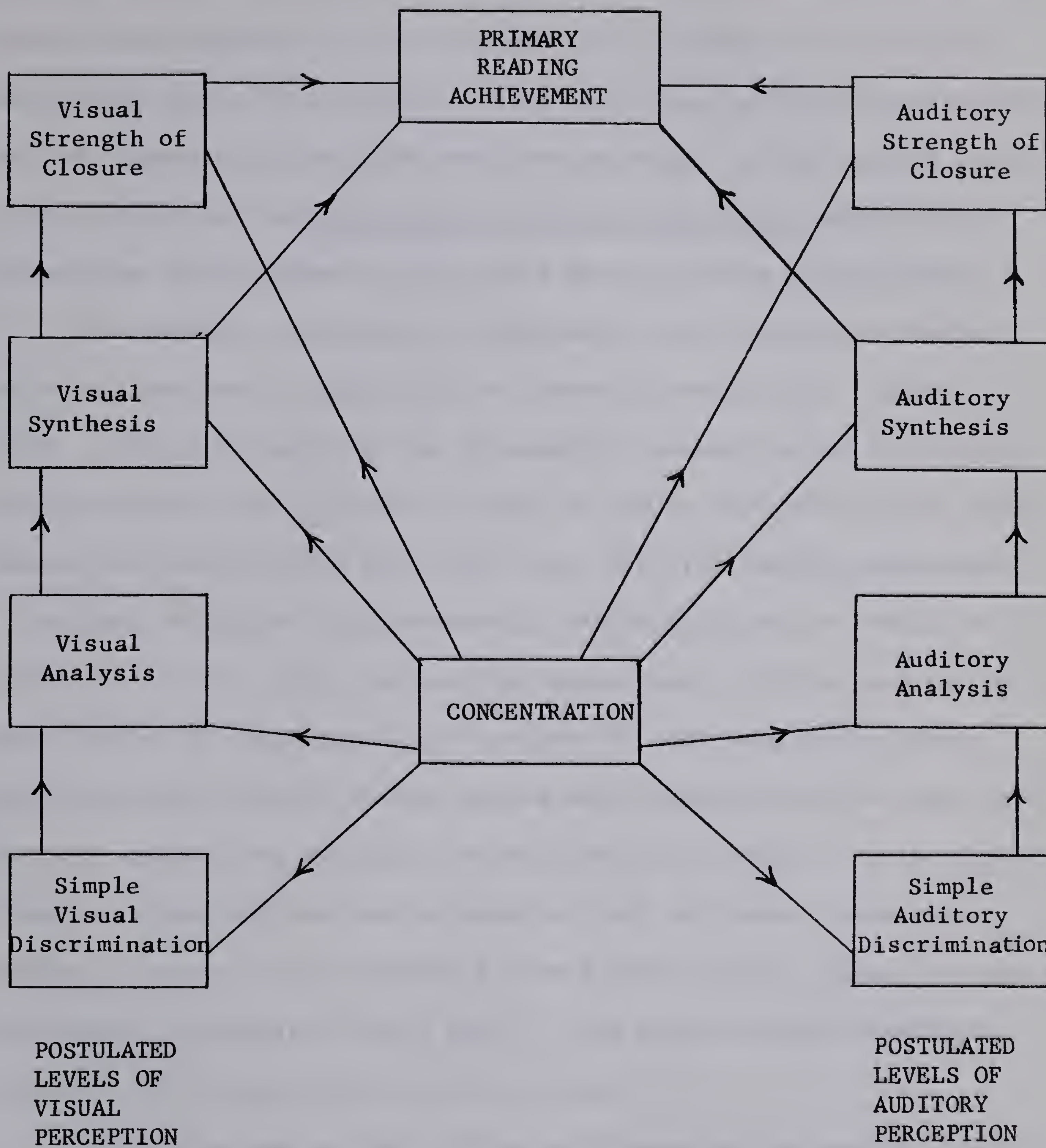


FIGURE 2

POSTULATED RELATIONSHIPS BETWEEN
CONCENTRATION AND PERCEPTION

supplement his basic sight vocabulary increasingly by attacking new words through sound-blending, it would appear to be important to success in reading for him to have reached a fairly high level of auditory perception, that of increasingly fine auditory discrimination. In the present study, it was hoped that the Wepman Auditory Discrimination Test might reveal differences in development of this area between good and poor readers.

The complex relationship of personality with success in reading has been discussed at length with no clear-cut conclusions. Piaget (1962, p.130) has suggested that personality, perception and intelligence are intertwined, and therefore it might be conjectured that each of these factors are inter-related with each other, and with reading achievement. It has been postulated that personality traits might act as attention-regulators in both visual and auditory perception. If this were so, it might further be conjectured, as in Figure 2, that personality traits could contribute towards success in the more complex stages of visual and auditory analysis and synthesis, where attention is vital. In the final stages of visual and auditory perception, that of closure, when the results of analysis and synthesis are held and retained, against distracting stimuli, personality traits might be the basic qualities underlying strength of both visual and auditory closure.

Perhaps because of the difficulty of measuring personality traits, only one other investigator (Malmquist, 1958) has studied the relationship of personality, together with other factors to reading achievement at the primary level. An adaptation of his personality rating-scale has been used in the present study. Malmquist included visual perception and

intelligence, but not auditory perception, among his independent variables.

The present study was planned to investigate the inter-relationships of visual and auditory perception, intelligence and personality traits with reading achievement at the end of grade one. It was also designed with a view to finding a combination of testing-instruments that could be used by grade one teachers for early diagnosis and remediation of reading deficiency.

CHAPTER III

THE EXPERIMENTAL DESIGN

This chapter will describe (a) the research population, (b) the areas measured, (c) the testing instruments, (d) the rating scale, and (e) the analysis of the data.

THE RESEARCH POPULATION

A review of the research into the causes of reading disability indicates that many variables may contribute to produce a retarded reader. If a continuous population were examined, so many elements which contribute to their reading achievement would be present that no significant factor would emerge as a major cause of reading retardation or success. Furthermore, the older the children, the more numerous and more difficult to measure become the variables. In an effort, therefore, to examine certain personality and perceptual elements which may be the bedrock underlying reading achievement, it has been deemed necessary to examine these personality and perceptual qualities in two extreme groups rather than a continuous population, and furthermore to choose young subjects, children beginning their grade two year. If the findings prove positive, it is hoped that a later researcher may investigate them with a normal population.

In order to examine the relationship of personality and perception to reading achievement, the investigator chose to work with two stratified samples from a population of children beginning their second year

in school, who were of potentially normal intelligence, with no major physical, emotional or home problems. One group would be below-average readers, and the other above-average readers.

1. <u>The Selection of the Below-Average Readers</u>

In June 1965, 6514 children were finishing their first year of school in the City of Edmonton, Alberta, Canada. The grade one teachers administered achievement tests whose scores they compiled together with group intelligence, health and personality data on class-record sheets. Complete information on only 5612 children was received by the central office of the Edmonton Public School Board. The reduction in size from 6514 to 5612 may be due to absences from school on any of the testing days, or incomplete record-keeping by teachers. In order to select the sample of below-average readers, the investigator scrutinized the data on the available 5612 students but did not consider for inclusion in the research population:

a) Those children not in the range of average intelligence (below 90 or above 120) on the group intelligence tests administered to all children of the Edmonton Public School System during their grade one year 1964-65.

b) Children who had below-average ability in arithmetic (scoring below a B standing, a raw score of 60) on the <u>Edmonton Final Arithmetic Test</u> given to all grade one children in June 1965.

c) Children showing major emotional disturbance in the opinion of the grade one teacher and recorded by her on the class-record sheet.

A preliminary list eas then compiled as a possible research sample from the remaining total population by noting on the class-record sheets which children could be designated below-average readers by virtue of a composite score of fifty or less (rating B or C but not D) on the Gates Primary Paragraph and the Edmonton Word Recognition Tests. The possible sample at this stage consisted of one hundred and thirty-one below-average boy readers and seventy-seven below-average girl readers.

Seven schools with forty-seven below-average boy readers and twenty-four below-average girl readers were then chosen because:

(1) there were at least two below-average readers, one of which was female in each school,

(2) together they presented a gradation of socio-economic status from lower to upper middle class. Two administrators from the central office were asked to classify each school according to housing surrounding it. A check by the investigator on occupation of fathers of all potential subjects supported the classification according to this rather crude measure of socio-economic level,

(3) the schools were within reasonable travelling distance of the investigator's office.

Further exclusions from the sample were now made of :

d) children showing major emotional disturbance from the combined opinion of their present teacher (after two months' daily observation) and of the investigator in the testing situation,

e) children whose home background was likely to affect their

reading achievement (for example, wards of the government). This information was obtained from cumulative records and interviews with the school staff.

f) those having gross physical disabilities (for example defective vision, auditory acuity or speech) which had already been detected by the classroom teacher or the school medical service, and recorded on the child's medical card.

As a further check against visual and auditory defects the investigator carried out telebinocular screening with a Keystone Telebinocular Model and individual audiometric screening with a Maico Audiometer on forty-three potential subjects.

Up to this stage the following exclusions had been made:

emotional	home	eyes	ears	speech	moved	absent	boys	total exclusion of poor readers
5	4	5	4	3	7	6	7	41

bringing down the sample of seventy-one poor readers from the seven schools down to thirty poor readers, from six schools.

At this stage

15 below-average boy readers

and

15 below-average girl readers

had been found who fulfilled all the above requirements. They were all of potentially normal intelligence, of average achievement in arithmetic

but of below-average achievement in reading, although there were apparently no adverse emotional, physical or home problems.

2. The Selection of the Above-Average Readers

Thirty other children were then selected who fulfilled all the above requirements a) to f), that is they were of potentially normal intelligence, of at least average achievement in arithmetic, with no apparent adverse emotional, physical or home problems, but who could be classed as above-average readers, by virtue of an A rating (but not H), with a composite score of ninety or above on the Gates Primary Paragraph and the Edmonton Word Recognition Tests.

The two groups were matched according to sex and to school, to as near as possible group intelligence scores, and in twenty-five out of the thirty pairs to the grade one teacher.

Telebinocular and audiometric screening was carried out on thirty-seven children in order to secure this sample of thirty above-average readers. Four good readers were rejected for defective vision and three for defective hearing.

THE AREAS MEASURED

The following tests were used to determine levels of reading achievement, visual perception, auditory discrimination, aural vocabulary and intelligence.

Reading Achievement

1. The Edmonton Public School Word Recognition Test (Revised

1961) a group test administered in June 1965.

2. The Gates Primary Reading Test (Type PPR), a group test administered in June 1965.

Visual Perception

The Marianne Frostig Developmental Test of Visual Perception, a group test administered in October 1965.

Auditory Discrimination

The Wepman Auditory Discrimination Test (Form 1), an individual test administered in September 1965.

Aural Vocabulary

The Peabody Picture Vocabulary Test (Form B), an individual test administered in September 1965.

Intelligence

The Stanford-Binet Test (Form L-M), an individual test administered in November 1965.

A five point rating scale was adapted by the investigator after Malmquist (1958) to measure three personality variables, namely, concentration, dominance/submissiveness and persistence. The Personality Rating Scale was completed by classroom teachers in November 1965.

THE TESTING INSTRUMENTS

The Reading Tests

The investigator summed each subject's score on two reading tests in order to obtain a measure of reading achievement. Both tests were administered by classroom teachers as part of the regular grade one testing program in the Edmonton Public Schools in May or June 1965. Raw score data were used to obtain the composite scores hereafter known as the Achievement Criterion.

1. The Edmonton Public School Board Word Recognition Test (Revised 1964), consists of two parts. Part A (Word Recognition) contains thirty-nine items each requiring a child to circle one of four printed words to match an accompanying picture. There is a correction for guessing. The test measures the ability to recognize representative single words.

Part B (Vocabulary) requires the pupil to read sentences with understanding. There are twenty-two incomplete sentences which the child is expected to complete by circling which of three given alternative words he considers best fits the meaning.

A sample is worked with the class before each part of the test. No data on reliability or validity are officially available, but an unofficial check on the original data in central office files revealed the mean to be 60.80 and the standard deviation 23.135. Local norms were established on 2379 children. Directions for administering are the same as for the Gates Primary Word Recognition Test. (Maximum Score = 100.)

2. <u>The Gates Primary Paragraph Reading Test (Type PPR)</u>. This test has twenty-six items of increasing difficulty, each of which requires the reading of a short paragraph including a command to make a specified mark on an illustration connected with the meaning of the paragraph. This test measures the pupil's ability to comprehend paragraphs so thoroughly that he can successfully follow directions. The Gates manual contains directions for administering and scoring, as well as grade, age and percentile norms. The Primary Test was revised and re-standardized in 1958 on 4,600 children. Local norms have been established.

The manual gives useful advice concerning reliability of scores, including a table 'Ratings of the probable reliability and significance of the difference between the reading grades on two tests.' (Maximum score twenty-six.) Buros (1965) notes that "the (Gates) tests correlate well with other measures of reading ability, including overall appraisals by classroom teachers .... but leave much to be desired as diagnostic instruments." (p.793)

3. <u>The Marianne Frostig Developmental Test of Visual Perception</u> was standardized in 1963 on over 2,100 children living in South Carolina between the ages of three and nine. It was constructed to explore the development of visual perception in five areas which seemed to have particular relevance to primary school performance, namely:

a) eye-motor coordination,

b) figure-ground perception,

c) constancy of shape,

d) position in space and

e) spatial relationships.

The child is asked to attempt carefully graded exercises in each of these areas. Administration may be either individual, or, as in the present testing situation, group. Scoring is objective. The child's raw score for each sub-test may be converted to a perceptual age-equivalent, representing the age the average child achieves this score. Means, standard-deviations and upper and lower quartiles are recorded for each half year level between five and eight years. Test, re-test and split-half reliability coefficients are given.

Correlation studies are reported between scores on the test and kindergarten teacher-ratings of classroom adjustment, reading achievement in first grade, and the Goodenough Intelligence Test. The manual suggests that the test may be used as a screening device with kindergarten and first-grade children, in order to identify those requiring special perceptual training, or as a clinical tool to diagnose specific weaknesses of older retarded readers. Buros (1965) indicates that "its prime use at this time would seem to be that of predicting learning success in the primary grades." (p.554)

The sample is deficient geographically and socio-economically, because it was drawn from a restricted area and is predominatly middle-class. The investigator administered this test exactly according to manual directions for group administration.

Raw score data were used in this study.

The Marianne Frostig Test of Visual Perception was selected by the investigator because:

i. it explores the development of visual perception in five areas,

ii. it is designed for the age-range of her research population,

iii. it is standardized,

iv. it can be administered in a group or individual testing situation, is scored objectively, and both administering and scoring can be done by a classroom teacher,

v. of its diagnostic possibilities for remedial work.

4. The Wepman Auditory Discrimination Test, (Form 1), standardized in 1960 on 533 unselected first, second and third grade children in both urban and non-urban communities, determines a child's ability to recognize the fine differences that exist between the phonemes used in English speech. Forty pairs of carefully selected words are presented orally by the examiner to an individual child, who is seated with his back to the tester. The pairs may be identical or differ in one sound, either initially, medially or finally. The child indicates verbally or by a motion of the head whether he recognizes similarity or difference to the examiner, who records the responses. Two equated forms of the test are available. The test has been found useful, particularly in lower elementary grades, in selecting children who are slower than their peers in developing auditory discrimination. This ability has been found to be highly related to the development of speech accuracy, and somewhat related to reading achievement. Administration to five and six year olds permits the screening of those likely to have difficulty learning to use phonics.

The test is useful for older children in differential diagnosis of reading and speech difficulties. It is administered individually, and takes about five minutes. Scores that should be considered invalid or judged to show inadequate development at age-levels from five to eight years are given in the manual.

Test-retest administration showed a reliability of +.91 (N=109). Various validation studies are reported in the manual, mostly at the grade one and two level, and further standardization measures will be reported in the literature as collected. Buros (1965) recommends the Wepman Auditory Discrimination Test as "a quick, inexpensive, easy to score, and accurate test of auditory discrimination." (p.941)

The investigator administered this test exactly as the manual directs for an individual testing situation.

The Wepman Auditory Discrimination Test was selected by the investigator because:

i. an auditory perceptual test was required,

ii. it is particularly suitable for the age-range of her sample,

iii. it is standardized,

iv. it is quickly administered, objectively scored, both of which tasks may be performed by a classroom teacher,

v. of its diagnostic potential for remedial work.

5. The Peabody Picture Vocabulary Test, standardized on 4,012 white children in Nashville, Tennesee, between the ages of two and a half and eighteen years in 1958, used different procedures for subject-

selection and/or test administration at pre-school, early elementary, upper elementary and high school levels, so that norms could be provided which would be of use throughout the United States. The subject is simultaneously presented with a stimulus word spoken by the examiner, and a page containing four pictures. He is asked to point to or indicate which picture fits the spoken word, thus furnishing a measure of his verbal intelligence through his hearing vocabulary. The test is discontinued when a basal and ceiling level have been established, and takes not more than ten minutes time. Age equivalents (mental ages), standard score equivalents (intelligence quotients), or percentile equivalents may be quickly calculated from tables in the manual. Two parallel forms are available. Reliability coefficients are .74 for seven year olds. Standard error of measurement is 7.65 for that age level. Further studies reported in the manual suggest that the Peabody Picture Vocabulary Test is a reasonably stable instrument for average, mentally retarded and cerebral-palsied children. No evidence has been accumulated on test-retest or long-term reliability of Peabody Picture Vocabulary Test scores. Validity data has been obtained for both the individual items and the total test. Content, construct and item validity appear to be satisfactory.

Congruent validity is the extent to which the Peabody Picture Vocabulary Test compares with other well-established measures of the same function. Using mentally retarded and cerebral-palsied children, equivalent scores on the Revised Stanford-Binet Tests of Intelligence and the Peabody Picture Vocabulary Test were correlated.

Number and Type	Age Range	Validity Coefficient
315 'educable' children	6 to 18 years	0.76
220 'trainable' children	6 to 16 years	0.66

The author considers the Peabody Picture Vocabulary Test and the Stanford Binet Intelligence Test to overlap in the qualities they measure, but not to correspond exactly. He is of the opinion that the correlation of the Peabody Picture Vocabulary Test with other intelligence tests has limited value, because it involves 'circularity in reasoning,' for it does not indicate whether one test is superior or inferior to the other. All statistical validity on this test is limited and preliminary, awaiting further evidence from researchers. The weakest points of the test (where reliability coefficients are lowest) appear to be at the sixth year, thirteenth year and superior adult levels. Buros (1965) considers the Peabody Picture Vocabulary Test to be "a highly usable test, of moderate reliability and largely unestablished validity." (p.530) He warns that "considerable caution needs to be used in interpreting the norms."

The investigator selected the Peabody Picture Vocabulary Test for her study because:

i. it affords an individual measure of intelligence through hearing vocabulary and through gesture,

ii. it is apparently suitable for the age-range of her population,

iii. it is standardized,

iv. it is speedily administered, scored objectively and

could have both operations easily performed by a classroom teacher,

v. she wished to try it on an average population,

vi. she wished to compare its scores to the Stanford Binet Test scores also obtained on her population.

The Peabody Picture Vocabulary Test was administered according to manual directions by the investigator.

6. The Stanford Binet Test (Form L-M) is an individual intelligence test originally evolved in France by Binet and Simon, and then revised in 1916 by Terman with a white American population between the ages of three and sixteen. It attempts to measure not separate mental abilities but rather general mental adaptability which is expressed in mental age scores. A revision of the test in 1960 combined into a single form (the L-M) the best sub-tests from the two 1937 scales, L and M. Reason for inclusion was based on records over a five-year period on 4,498 subjects aged two and a half to eighteen years. Shifts in item-difficulties were found by comparing percentages of subjects passing individual tests in the 1950's with percentages of successes twenty years before. Criteria for selection of test-items in the new scale were:

a) increase in percentage passing with age (or mental age) and

b) validity established by biserial correlation between item and total score.

Adjustments were built in to make the average mental age at each level approximate more closely to the average chronological age. Revised and extended I.Q. tables made allowances for a typical variability of

intelligence at certain age-levels, so that standard scores are now comparable at all age levels. Buros (1965) notes the following advantages of the Stanford Binet: "Better coverage at the lower end of the scale, and more reliable assessment of the extreme ranges of intelligence." (p.831)

The Stanford Binet Test was selected after consultation with Dr. Dockrell of the Division of Educational Psychology, University of Alberta, because:

i. it provides an individual measure of intelligence,

ii. it provides a more reliable measure of intelligence at the seven year old level than the Wechsler Intelligence Scale for Children.

Administration of the sixty Stanford Binets was carried out by graduate students of the Division of Educational Psychology, University of Alberta.

DESCRIPTION OF THE RATING SCALE

The Rating Scale of Personality Variables was adapted from Malmquist (1958) to measure three personality traits, namely concentration, dominance-submissiveness and persistence, as rated by the children's present teachers. Each variable is graded from one to five, and the teacher is asked to indicate the pupil's place on the scale by circling the numeral that will represent the child's place in a heterogeneously grouped grade two class. The distribution of scores is to be based on a normal population so that in a class of thirty students, twelve to

fifteen would rate three, five to eight would rate two or four, and not more than three would rate one or five. The investigator gave each teacher a careful oral explanation of each variable at the beginning of September 1965 and supplied them with a written description of each quality to be observed, as follows:

A. Concentration

1	2	3	4	5
Exceptional ability to concentrate on assigned tasks. Never distracted by other children or activities	Good ability to concentrate. Rarely distracted. Engages in work assigned.	Average ability to concentrate.	Easily distracted. short attention span.	Cannot concentrate at all. Attention wanders incessantly.

B. Dominance/Submissiveness

1	2	3	4	5
Dominates fellow-pupils. Aggressive leader. Unable to be a follower.	Likes to be a leader. Can accept responsibility for group.	Average child. Rarely a leader but has ideas of his own.	Always a follower. Quiet and unobtrusive.	Timid, nervous, lacks confidence. Always needs encouragement. Afraid to do things alone.

C. Persistence

1	2	3	4	5
Unusual persistence. Rarely leaves a task until it is completed.	More than normal persistence.	Normal persistence.	Poor persistence. Inclined to leave tasks unfinished.	Extremely poor persistence. Leaves tasks begun almost immediately without completing same.

Since only one teacher will know the child, there is no chance of establishing reliability by a split-half method. Also such ratings will

be subject to the 'halo' effect. This may be counteracted by specifying and delimiting as thoroughly as possible the variables to be rated. As long an observation period as possible was permitted, -- at least eight weeks.

The investigator chose to use a Rating Scale of Personality Variables because she felt:

i. a five-point teacher rating might be as reliable a measure of personality factors as she could obtain with that age of sample population,

ii. personality factors might influence both visual and auditory perception, and the three combined together might provide a more adequate index of a child's total perception.

THE ANALYSIS OF THE DATA

The technique of multiple linear regression developed by Bottenberg and Young (1963) was selected as the general method of statistical analysis for the following reasons.

1. In order to obtain the optimal estimate of a given criterion variable (in this study, primary reading achievement), multiple linear regression analysis assigns a weight to each independent variable. The weight provides an indication of the degree and type of contribution each independent variable makes to predicting reading achievement when the other independent variables are held constant.

2. Through multiple linear regression can be indicated the combination of independent variables that provides the best prediction of the criterion variable. This combination includes only those independent variables whose weights (or partial regression coefficients) are statistically significant from zero at a specified level of probability.

3. Multiple regression analysis also furnishes a multiple correlation coefficient (R) which shows the degree of relationship between the predicted and observed scores for the criterion variable. The squared multiple correlation (R^2 or RSQ), represents the proportion of variance of the criterion that is predicted by the model.

In the present study, primary reading was assumed to be a function of visual perception, auditory discrimination, intelligence, and a personality trait, concentration. The relationship could then be expressed in the additive combination of a linear model.

X(1) is a function of X(2) + X(3) + X(4) + X(5) + error where:

X(1) is the combined E.W.R. and P.P.R. reading score,

X(2) is the composite D.T.V.P. score,

X(3) is the W.A.D.T. score,

X(4) is the S.B. score,

X(5) is the teacher's rating for concentration.

A predicted reading score $\hat{X}(1)$ was calculated by selecting weights (A2, A3, A4, A5) for each of the independent variables, so that the data could now be arranged,

$$\hat{X}(1) = A2\ X(2) + A3\ X(3) + A4\ X(4) + A5\ X(5) + \text{error}$$

By comparing the predicted reading scores with the observed reading scores, a multiple correlation coefficient (R) was obtained which measured the goodness of fit of predicted reading score $\hat{X}(1)$, to observed reading score, X(2). The squared multiple correlation, coefficient ($R1^2$ or RSQ), showed the proportion of variance in reading achievement that was predicted from the model.

In order to investigate the effect of one predictor, for example visual perception, X(2), in the presence of the others, a second linear model was written similar to the first equation, but excluding the visual perception score X(2).

$$\hat{X}(1) = A3\ X(3) + A4\ X(4) + A5\ X(5) + \text{error}$$

The second equation was called the restricted model, while the first designated the full model. The restricted model had a squared multiple correlation of $R2^2$.

In order to determine whether visual perception is significant predictor of primary reading achievement in the presence of the other variables, (auditory discrimination, intelligence and concentration), an F-ratio test was made:

$$F = \frac{(R1^2 - R2^2) / df1}{1 - R1^2 / df2}, \quad \text{where}$$

F is the F-ratio, which determines whether a statistically significant result had occurred,

$R1^2$ is the 'goodness' of prediction for the full model,

$R2^2$ is the 'goodness' of prediction for the restricted model,

dfl are the degrees of freedom for the numerator, (found by subtracting the number of weights to be found in the restricted model from the number of weights in the full model, in this case, 4 - 1 = 3),

df2 are the degrees of freedom for the denominator, (found by subtracting the number of weights in the full model from the number of subjects, in this case, 60 - 4 = 56).

The levels of probability less than .05 and less than .01 were considered as indicating whether the F-ratio was significant.

Restricted models were constructed to consider the effectiveness of each independent variable, singly, in pairs, or in triads to predict reading achievement. These were also tested against the full model, and F-ratios and probabilities obtained by the computer.

Means, standard deviations and inter-correlations of sub-groups were obtained through the general descriptive statistics program. The differences between variances was tested by an F-ratio test, while the difference between means was tested by the t-test, both for independent samples.

CHAPTER IV

ANALYSIS OF DATA AND INTERPRETATION

The results of the statistical analysis of the data provided by testing sixty children at the end of grade one and beginning of grade two from eight different schools in the city of Edmonton, Alberta, Canada, are presented in this chapter. The relationships between visual perception, auditory discrimination, intelligence, personality characteristics and primary reading achievement are shown in table form and then discussed as follows:

a) The means and standard deviations of the criterion variable, reading achievement, and the predictor variables, performance on tests of visual and auditory perception, intelligence, and teacher-ratings on three personality characteristics are reported for the total group with commentary.

b) The means and standard deviations of the above variables are then reported separately for two groups of subjects: thirty children designated as below-average readers, and thirty children designated as above-average readers, by virtue of their composite score on the Edmonton Public School Board Word Recognition Test and the Gates Primary Paragraph Reading Test (Type PPR).

c) The correlations of reading with all other variables within the total group are reported and discussed.

d) The correlations between variables other than reading in the total group are reported and discussed.

TABLE I

MEANS AND STANDARD DEVIATIONS OF SCORES OF TESTS OF READING, PERCEPTUAL ABILITIES, INTELLIGENCE AND PERSONALITY RATINGS

N = 60

Test	Mean	Standard Deviation
Reading Achievement	73.58	31.19
Frostig Test of Visual Perception		
Sub-Test I	16.25	3.69
Sub-Test II	18.02	2.38
Sub-Test III	10.28	2.85
Sub-Test IV	7.20	.89
Sub-Test V	6.55	1.20
Composite Total	58.50	6.34
Wepman	3.58	3.12
Peabody	102.65	13.72
Stanford Binet	113.50	13.12
Personality Ratings		
Concentration	3.12	.82
Dominance/Submissiveness	3.13	.87
Persistence	3.00	.75

e) The multiple correlations of variables within the two sub-groups are presented and discussed.

f) A preliminary multiple linear regression analysis using all variables originally investigated in the study is reported and discussed.

g) The predictor variables are reduced to four, and the reasons for the selection of these four set down. Regression equations are derived, and the predictive values of variables, singly or in combinations for reading achievement are estimated and discussed.

MEANS AND STANDARD DEVIATIONS OF ALL DATA FOR THE TOTAL GROUP

The means and standard deviations for the total population of sixty subjects are shown in Table I. The standard deviation of the reading achievement score is high but artificially inflated by the design of the experiment. The poor readers scored fifty or less, a B or C rating, but not D, and the good readers ninety or more, meriting an A rating but not an H, on a combined score of the end-of-grade-one reading tests, so that all scores are substantially different from the mean of the combined groups.

Attention should be drawn to the standard deviations of D.T.V.P. sub-tests II and IV, in which the mean is close to the maximum score, and so the standard deviations are small. D.T.V.P. sub-test II requires the children to isolate simple shapes, such as stars and triangles, from increasingly distractible backgrounds. In D.T.V.P. sub-test IV the children's ability to perceive position in space is tested. The easier items require them to detect a figure facing a different direction from

all the surrounding figures, while the more difficult items require them to mark a figure positionally identical with the stimulus figure, while the surrounding figures face in different directions. It would appear that the aspects of visual perception being assessed by these two sub-tests had matured in many of the sixty children in this study by the beginning of their grade two year.

D.T.V.P. sub-test V, where a child demonstrates his ability to analyse spatial relationships by copying figures ranging from simple to complex by drawing lines between dots, was also limited in its effectiveness by this same defect, but to a lesser extent.

The scores of D.T.V.P. sub-tests I and III and the composite D.T.V.P. score produced means sufficiently different from the maximum to allow for an adequate range of scores as shown by the standard deviations.

The W.A.D.T. detects errors in auditory discrimination, so a low score on this measure would indicate good discrimination. Wepman (1958) found that this perceptual ability as measured by his test improves as the child matures. The mean error score of 3.58 in the present study compares favourably with Wepman's finding, that seven-year-old children show adequate discrimination if they make an average of four errors on his test.

Since the children selected were in the average range of intelligence, with intelligence quotients of between ninety and one hundred and twenty on the <u>Detroit Beginning First Grade Intelligence Test</u>, the standard deviations for the S.B. and P.P.V.T. are less than is normally reported, but not significantly so. An interesting difference

TABLE II

MEANS AND STANDARD DEVIATIONS OF POOR READERS AND GOOD READERS ON SCORES OF PREDICTOR AND CRITERION VARIABLES

		Poor Readers N = 30	Good Readers N = 30	Test of Difference of Means	Significance Level
Frostig Test of Visual Perception					
Sub-Test I	$\bar{X}$	14.53	17.63	3.054	.01
	S	4.21	3.49		
Sub-Test II	$\bar{X}$	17.10	18.60	2.100	.05
	S	3.16	2.20		
Sub-Test III	$\bar{X}$	9.10	11.47	3.472	.01
	S	2.23	2.92		
Sub-Test IV	$\bar{X}$	7.03	7.37	1.451	NS
	S	.84	.91		
Sub-Test V	$\bar{X}$	6.20	6.90	2.316	.05
	S	1.25	1.04		
Composite Score	$\bar{X}$	54.63	62.37	5.858	.001
	S	5.50	4.50		
Wepman Auditory	$\bar{X}$	5.30	1.87	5.015	.001
	S	3.47	1.26		
Peabody Vocabulary	$\bar{X}$	101.00	104.30	.923	NS
	S	10.98	15.82		
Stanford Binet	$\bar{X}$	103.53	120.13	3.766	.001
	S	20.82	11.41		
Personality Ratings Concentration	$\bar{X}$	3.70	2.53	7.740	.001
	S	.59	.56		
Dominance/Submissiveness	$\bar{X}$	3.63	2.63	5.391	.001
	S	.75	.66		
Persistence	$\bar{X}$	3.43	2.57	5.361	.001
	S	.50	.72		
Reading Achievement	$\bar{X}$	41.53	104.07	27.853	.001
	S	9.75	7.15		

is observed between the means of these two tests. The S.B. mean is almost eleven points higher than the P.P.V.T. mean, possibly because the S.B., unlike the P.P.V.T., tests more than aural vocabulary.

The type of rating scale used for personality characteristics accounts for the low values reported for these variables. As the scale ranges from one to five points, the mean for normal distribution would be 3.00. Hence the standard deviations are of necessity correspondingly small.

MEANS AND STANDARD DEVIATIONS OF ALL DATA FOR THE TWO SUB-GROUPS

Support for the combining of the four groups into two came from the insignificant correlation of sex with all other variables. Nevertheless, in the good reader sub-group, sex shows a positive correlation with reading achievement, ($r = .37$), in favour of maleness.

The means and standard deviations for all scores within each sub-group of thirty subjects are presented in Table II. The variances of the sub-groups were tested for homogeneity, using the formula $F = \frac{S_1^2}{S_2^2}$ so as to produce a ratio greater than unity. The table of F-ratios was entered with N-1 degrees of freedom for the numerator and the denominator. ($N_1 = N_2$) In no case was the difference between the variance of the two sub-groups found to be statistically significant at the five per cent level of confidence. The significance of means between each sub-group was ascertained using a two-tailed t-test for independent samples.

All differences were found to be significant at the one per cent level of confidence or better with the following exceptions. The difference between the means of scores on D.T.V.P. sub-test IV (the ability to accurately perceive position in space), is not significant. For D.T.V.P. sub-test II (the ability to differentiate figure from ground) and V, (the ability to analyse spatial relationships), the difference in means is significant at the five per cent level of confidence. These results appear to reinforce the evidence found in Table I, that by the beginning of the grade two year, the ability to perceive position in space as measured by D.T.V.P. sub-test IV, and to a lesser extent, the abilities to distinguish figure from ground (D.T.V.P. sub-test II), and to analyse spatial relationships (D.T.V.P. sub-test V), had matured sufficiently in many of the sixty subjects under study so that those particular aspects of visual perception were no longer an important factor influencing their reading achievement.

It should however be noted that the difference in means on the remaining D.T.V.P. sub-tests, I (Eye-Motor Coordination), and III (Form Constancy), are significant at the one per cent level of confidence, while the combined D.T.V.P. score produced difference in means at an even better than one per cent level of confidence.

The means of the scores on the P.P.V.T. show no significant difference between below-and above-average readers. Apparently there was no great difference between the aural vocabulary of good and poor readers in this study at the primary level.

All remaining measures, auditory discrimination, intelligence and

TABLE III

CORRELATIONS OF READING ACHIEVEMENT SCORES WITH SCORES ON FROSTIG DEVELOPMENTAL TEST OF VISUAL PERCEPTION, WEPMAN TEST OF AUDITORY DISCRIMINATION, PEABODY PICTURE VOCABULARY TEST, STANFORD-BINET INTELLIGENCE SCALE, PERSONALITY RATINGS AND SEX

N = 60	Marianne Frostig Developmental Test of Visual Perception								Personality Ratings Derived from Malmquist				Sex
	Sub-Test I	Sub-Test II	Sub-Test III	Sub-Test IV	Sub-Test V	Composite Score	Wepman Test of Auditory Discrimination, Form I	Stanford-Binet Form L-M Intelligence Quotient	Concentration	Dominance/ Submissiveness	Persistence	Peabody Picture Vocabulary Test, Form B	Male
Reading Achievement (composite score of Edmonton Public School Board Word Recognition Test and Gates Primary Paragraph Reading Test (PPR))	.361	.241	.445	.206	.313	.615	-.571	.536	-.696	-.557	-.577	.157	-.051
Significance Level	<.01	NS	<.01	NS	<.05	<.01	<.01	<.01	<.01	<.01	<.01	NS	NS

Correlations r > .33 exceed the 1% level of confidence
r > .26 exceed the 5% level of confidence

personality ratings show, as was expected, significant difference of means.

MULTIPLE CORRELATIONS BETWEEN READING AND THE OTHER VARIABLES IN THE TOTAL GROUP

Correlations between reading and the other variables for the complete sample of sixty children are shown in Table III. Those exceeding .26 are significant at the five per cent level of confidence, and exceeding .33 at the one per cent level of confidence. In the present study, all correlations with the reading score are significant at the one per cent level of confidence, with the exception of three of the D.T.V.P. sub-tests, the P.P.V.T. and the sex of the subjects.

D.T.V.P. sub-test V, the ability to analyse spatial relationships, correlates significantly with reading at the five per cent level of confidence, while the correlations of D.T.V.P. sub-test II, the ability to distinguish figure from ground, and D.T.V.P. sub-test IV, the ability to discern position in space, are not significant. Further corroborative evidence is thus provided to support the findings from the previous tables, that in the sixty subjects of the study, the particular aspects of visual perception measured by D.T.V.P. sub-tests II, IV and V were not major factors governing their ability to read.

The P.P.V.T. score provides the lowest correlation, (.157) of all variables, except sex, with reading. This finding bears out the evidence presented by the insignificant difference in P.P.V.T. means between good and poor readers in the previous section. It helps to emphasize that

among the sixty children of average intelligence in this study, their understanding of aural vocabulary did not greatly influence their ability to read at the primary level.

The lowest correlation of all variables with reading is that of sex. This result may be put down to the design of this experiment, which required an equal number of male and female above-and below-average readers, in a specific attempt to rule out the influence of sex on reading achievement from the present investigation. It is realized by the investigator that there are many more male poor readers than female, but the influence of sex was not under investigation in this study, and so from this point onwards will not be included.

The highest correlations with reading achievement are the combined D.T.V.P. score, the three personality ratings, the W.A.D.T. and S.B. scores. All are significant at the one per cent level of confidence or better. The personality rating for concentration provides the best correlation, -.696. It should be noted that, although the correlation coefficient has a minus value, the relationship is positive since a high score indicates a poor performance. Similarly, the other personality ratings and the auditory discrimination score produce correlation coefficients with minus values, except with each other, for the same reason.

The second highest correlation with reading proves to be visual perception as measured by the composite D.T.V.P. score, .615. Next comes another personality rating, for persistence, -.577, ranking before auditory discrimination, as measured by the W.A.D.T., -.571. After the

auditory measure comes the third personality rating for dominance/submissiveness, -.557, and last at the one per cent level of confidence, the individual intelligence score, as measured by the S.B., .536.

It is interesting to note that teachers' ratings of personality characteristics correlate comparatively highly with reading. One, concentration, has a higher correlation than any other variable, visual or auditory perception or intelligence. Two personality traits, concentration and dominance/submissiveness, correlate more highly than auditory discrimination with reading, while all three personality characteristics correlate better than an individual intelligence assessment.

In this study of sixty children, at the end of grade one and beginning of grade two, visual perception, as measured by the composite D.V.T.P. score, has a higher correlation with reading than does auditory discrimination as measured by the W.A.D.T., while both these measures of visual and auditory perception correlate more highly than intelligence. All three, however, are very significant.

CORRELATIONS BETWEEN VARIABLES OTHER THAN READING WITHIN THE TOTAL GROUP

Visual Perception

As expected, inter-correlations between the five D.T.V.P. sub-tests are low, indicating that they measure different aspects of visual perception. D.T.V.P. sub-test I, measuring eye-motor coordination, and D.T.V.P. sub-test III, measuring form-constancy, correlate particularly

TABLE IV

INTERCORRELATIONS OF PREDICTOR VARIABLES AND COMBINED READING SCORE IN THE TOTAL GROUP

N = 60	1. Reading	2. Frostig Sub-Test I	3. Frostig Sub-Test II	4. Frostig Sub-Test III	5. Frostig Sub-Test IV	6. Frostig Sub-Test V	7. Frostig Composite	8. Wepman Auditory	9. Peabody Vocabulary	10. Stanford-Binet	11. Concentration	12. Dominance/Submissive	13. Persistence	14. Sex (Male)	15. Sex (Female)
1. Reading	1.000	.361	.241	.445	.206	.313	.615	-.571	.157	.536	-.696	-.557	-.577	.051	-.051
2. Frostig Sub-Test I		1.000	.121	.274	.010	.033	.722	-.212	.185	.113	-.435	-.245	-.438	-.050	.050
3. Frostig Sub-Test II			1.000	.122	-.088	-.178	.348	-.082	.141	.313	-.284	-.220	-.168	.077	-.077
4. Frostig Sub-Test III				1.000	.345	.115	.726	-.294	.244	.493	-.286	-.353	-.295	.099	-.099
5. Frostig Sub-Test IV					1.000	.255	.375	-.138	-.026	.043	-.078	-.100	-.050	-.075	.075
6. Frostig Sub-Test V						1.000	.329	-.090	-.043	.181	-.065	.058	.018	-.180	.180
7. Frostig Full Score							1.000	-.332	.275	.410	-.522	-.398	-.461	-.032	.032
8. Wepman Auditory								1.000	-.003	-.413	.450	.311	.333	-.027	.027
9. Peabody Vocabulary									1.000	.458	-.105	-.225	-.179	.232	-.232
10. Stanford-Binet										1.000	-.470	-.387	-.309	.193	-.193
11. Concentration											1.000	.613	.649	.143	-.143
12. Dominance/Submissiveness												1.000	.537	-.154	.154
13. Persistence													1.000	.089	-.089
14. Sex (Male)														1.000	-1.000
15. Sex (Female)															1.000

Correlations $r > .33$ exceed the 1% level of confidence
$r > .26$ exceed the 5% level of confidence

highly, .722 and .726 respectively, with the composite D.T.V.P. It will be recalled that these two sub-tests provide highly significant differences of means between the good and poor readers, and also correlate at the one per cent level of confidence with reading achievement.

D.T.V.P. sub-test I correlates well with concentration (-.434 <.01), while D.T.V.P. sub-tests III and IV have correlations with a lesser degree of confidence (-.285 and -.284 <.05 respectively). Concentration also enjoys a strong relationship with the composite D.T.V.P. score (-.522 <.01), stronger than the relationship between the composite D.T.V.P. score and intelligence (.410 <.01).

Personality Ratings

The three personality ratings, concentration, dominance/submissiveness and persistence have high correlations with each other, .613 between concentration and dominance/submissiveness, and .649 between concentration and persistence. It seems that these personality traits overlap with each other to a certain extent, although their respective influences on the other variables, including reading, is shown to be not identical, from the varying degrees of correlations.

Concentration appears to be not only the strongest personality factor, but also the most powerful of all independent variables. It is interesting to note that concentration not only correlates more highly with visual perception (composite D.T.V.P., -.522 <.01), than does any other independent variable, but that concentration also enjoys a closer relationship with the individual intelligence score than does any other

predictor variable (.470 <.01).

Auditory Discrimination

Auditory discrimination, as measured by the W.A.D.T., is relatively independent of the other predictor variables. It is less dependent on concentration than are visual perception or intelligence, but even here, the relationship with concentration is significant (.450 <.01). Lesser but still significant correlations are with intelligence (-.413 <.01), visual perception (-.332 <.01), and with persistence (.333 <.01).

Intelligence

The highest correlation of the S.B. score after reading is with concentration (.470). Next comes aural vocabulary, as measured by the P.P.V.T. (.458), then auditory discrimination (-.413), and visual perception, particularly D.T.V.P. sub-test III, the measure to assess form constancy (.419), all significant at the one per cent level of confidence or better.

Correlations between the P.P.V.T. and the other variables prove disappointingly low. The only correlation significant at the one per cent level of confidence is the anticipated one with the S.B. score (.458). All other correlations are non-significant, with the exception of a .275 correlation with the composite D.T.V.P. score at the five per cent level of confidence.

TABLE V

INTERCORRELATIONS OF PREDICTOR VARIABLES AND COMBINED READING SCORE FOR GOOD AND POOR READERS SEPARATELY

$N_1 = N_2 = 30$

	Good Readers	Poor Readers
Frostig Test of Visual Perception		
1. Sub-Test I	-.135	.574**
2. Sub-Test II	.048	.502**
3. Sub-Test III	.200	.354
4. Sub-Test IV	.119	.067
5. Sub-Test V	.059	.038
6. Composite Score	.027	.373*
7. Wepman	-.003	-.268
8. Peabody	.234	.183
9. Stanford-Binet	.183	.759**
Personality Ratings		
10. Concentration	.182	-.205
11. Dominance/Submissiveness	.112	-.092
12. Persistence	.051	-.379*
13. Sex - Male	.373*	.212

* Significant at 5% level of confidence

** Significant at 1% level of confidence

Correlations $r > .361$ exceed the 5% level of confidence

$r > .463$ exceed the 1% level of confidence

CORRELATIONS BETWEEN READING ACHIEVEMENT AND THE OTHER VARIABLES WITHIN THE TWO SUB-GROUPS

The correlations of the predictor variables with reading achievement in each of the two sub-groups taken separately are set out in Table V. With a group of thirty subjects, and degrees of freedom equal to twenty-eight, the value of r for five per cent significance rises to .361, and for one per cent significance to .463. Not surprisingly, this produces a reduction in the size of correlation coefficients, and in the number that are significant. In fact, for the above-average readers, the only correlation that is significantly different from zero is that of sex. It is unexpected to find that maleness correlates positively with reading achievement for good readers.

The group of below-average readers provides more interesting correlations. Two of the D.T.V.P. sub-tests I, eye-motor coordination, and II, figure-ground, correlate significantly with reading at the one per cent level of confidence, while the composite D.T.V.P. score correlates with reading at the five per cent level. The correlation with intelligence as measured by the S.B. now assumes a dominant place with a very high correlation of .759. The only personality characteristic to retain a significant correlation with reading is persistence.

PRELIMINARY ANALYSIS USING FIFTEEN VARIABLES, ALL ORIGINALLY INVESTIGATED IN THIS STUDY

The technique of multiple linear regression was first applied to all the data gathered in this study in order to determine the independent

TABLE VI

PRELIMINARY REGRESSION ANALYSIS RESTRICTING IN TURN EACH OF THE FIFTEEN VARIABLES ORIGINALLY INVESTIGATED IN THIS STUDY OF SIXTY SUBJECTS

Row	Predictor	Criterion	RSQ full	RSQ restricted	F Ratio	Degrees of Freedom	Probability
1.	Frostig Visual Sub-Test I, in presence of other visual sub-tests, composite visual score, auditory discrimination, oral language, intelligence, concentration, dominance/submissiveness, persistence ratings and sex.	composite reading score (of Edmonton Word Recognition and Gates Primary Paragraph Reading)	.723	.723	.004	1/44	N.S.
2.	Frostig Visual Sub-Test II, in presence of the other fourteen variables.	composite reading score	.723	.722	.111	1/44	N.S.
3.	Frostig Visual Sub-Test III, in presence of the other fourteen variables.	composite reading score	.723	.723	.010	1/44	N.S.
4.	Frostig Visual Sub-Test IV, in presence of the other fourteen variables.	composite reading score	.723	.723	.000	1/44	N.S.
5.	Frostig Visual Sub-Test V, in presence of the other fourteen variables.	composite reading score	.723	.711	1.895	1/44	.2
6.	Frostig Visual Composite Score, in presence of the other fourteen variables.	composite reading score	.723	.723	.019	1/44	N.S.
7.	Wepman Auditory Discrimination Score, in presence of the other fourteen variables.	composite reading score	.723	.684	6.206	1/44	$<.05$

TABLE VI (continued)

Row	Predictor	Criterion	RSQ full	RSQ restricted	F Ratio	Degrees of Freedom	Probability
8.	Peabody Picture Vocabulary Test Score, in presence of the other variables.	composite reading score	.723	.723	.047	1/44	N.S.
9.	Stanford-Binet Intelligence Test Score, in presence of the other variables.	composite reading score	.723	.722	.149	1/44	N.S.
10.	Concentration rating, in presence of the other fourteen variables.	composite reading score	.723	.694	4.655	1/44	<.05
11.	Dominance/submissiveness rating, in presence of the other fourteen variables.	composite reading score	.723	.717	.920	1/44	N.S.
12.	Persistence rating, in presence of the other fourteen variables.	composite reading score	.723	.707	2.579	1/44	N.S.
13.	Sex, in presence of the other fourteen variables	composite reading score	.723	.711	1.866	1/44	N.S.

Note: RSQ = squared multiple correlation.

full = regression equation including all predictors named.

restricted = regression equation not including predictor whose effect is being investigated.

contribution of each test or rating as a predictor of reading achievement in the presence of the remaining fourteen variables originally investigated. However, a study of this nature, which used fifteen independent variables and sixty subjects, required degrees of freedom of 1/44 when calculating the F-ratios in order to determine probability.

The regression analysis for fifteen variables, assessing the relative value of each in turn by regressing it from the original full model, is presented in Table VI.

Only two variables, concentration and auditory discrimination, demonstrate their usefulness as independent predictors of reading achievement in the presence of all the other fourteen variables, by showing significantly high enough F-ratios at the five per cent level of probability. A certain amount of redundancy was present in the original full model linear equation, because the composite D.T.V.P. score was included in addition to each separate D.T.V.P. sub-test. This inclusion was done specifically in order that all possible multiple correlations might be secured between every variable in the study. The redundancy may explain why, when the composite D.T.V.P. score is regressed from the full linear model, no appreciable difference is seen between the squared multiple correlations, and therefore both F-ratio and probability are insignificant.

The F-ratio of the auditory discrimination score is higher than that for any other variable, perhaps because of its relative independence of any other variable in this study, as has been shown in the discussion of multiple correlations between auditory discrimination and other

variables from Table IV.

The power of the concentration rating is demonstrated by the fact that it scores the second highest F-ratio and correspondingly low probability in this preliminary regression analysis, thus proving its usefulness as a predictor of reading achievement in the presence of all the other variables, even though, unlike the W.A.D.T., it possesses relatively high inter-correlations with many of them, which would detract from its weight as an independent contributor.

However, the value of the concentration rating is subject to certain limitations, which will be discussed in chapter V. Since each subject was known to only one teacher, there was no convenient way of establishing a reliability coefficient for the personality ratings.

REGRESSION ANALYSIS USING FOUR SELECTED INDEPENDENT VARIABLES AS PREDICTORS OF READING ACHIEVEMENT

An effort was now made to determine which of the predictor variables investigated in the study would combine to form an effective battery to assess primary reading achievement.

Ferguson (1959) has noted:

> Investigators concerned with problems of prediction frequently attempt to identify independent variables which show a high correlation with the criterion and a low correlation with each other. If two variables have a fairly high correlation with the criterion and a low correlation with each other, both measure different aspects of the criterion, and both will contribute substantially to prediction. If two variables have a high correlation with each other, they are measures of much the same thing, and the inclusion of both, instead of either one or the other, will contribute little to the prediction achieved. (p.302)

TABLE VII

REGRESSION ANALYSIS USING FIVE SELECTED VARIABLES AND RESTRICTING SINGLE PREDICTORS IN TURN

Row	Predictor	Criterion	RSQ full	RSQ restricted	F Ratio	Degrees of Freedom	Probability
14.	Frostig Visual Composite Score, in presence of Wepman Auditory Discrimination, Stanford-Binet Intelligence scores and concentration rating.	composite reading score	.679	.626	9.171	1/56	<.01
15.	Wepman Auditory Discrimination Score, in presence of visual composite and intelligence scores, and concentration rating.	composite reading score	.679	.632	8.037	1/56	<.01
16.	Stanford-Binet Intelligence Score in presence of visual and auditory scores and concentration rating.	composite reading score	.679	.654	4.351	1/56	<.05
17.	Concentration rating, in presence of visual auditory and intelligence scores.	composite	.679	.599	13.822	1/56	<.01

In an attempt to reduce redundancy and thereby increase the effectiveness of prediction, the following variables were discarded.

1. The D.T.V.P. sub-tests. The D.T.V.P. composite score was retained because of its higher correlation with reading than any of the D.T.V.P. sub-tests.

2. The P.P.V.T., because it did not correlate significantly with reading and yet overlapped to a certain extent with the S.B. intelligence score.

3. The two personality ratings, dominance/submissiveness and persistence, because of their high correlation with concentration. Concentration was retained because of its dominant position in all previous tables, whether of inter-correlations or previous linear regression equations.

4. The sex variable, because of its insignificant correlation with reading achievement, probably due to the design of this study in including equal numbers of male and female readers.

Reading achievement was now held to be a function of visual perception, as measured by the composite D.T.V.P. score, auditory discrimination, as measured by the W.A.D.T., intelligence as measured by the S.B. score, and concentration, as measured by a five point teachers' rating. Table VII presents the results of the regression analysis, using the above four selected independent variables, and determining their relative usefulness as predictors of primary reading achievement by restricting each single variable in turn. Questions could now be asked regarding the value of each single predictor's contribution to the

TABLE VIII

REGRESSION ANALYSIS RESTRICTING COMBINATIONS OF TWO VARIABLES IN TURN FROM THE FOUR SELECTED PREDICTORS OF PRIMARY READING

Row	Predictor	Criterion	RSQ full	RSQ rest-ricted	F Ratio	Degrees of Freedom	Proba-bility
18.	Frostig Visual Composite and Wepman Auditory Discrimination Scores, in presence of intelligence and concentration.	composite reading score	.679	.574	9.124	2/56	<.01
19.	Frostig Visual Composite and Stanford-Binet Intelligence Scores, in presence of visual perception and concentration.	composite reading score	.679	.571	9.401	2/56	<.01
20.	Frostig Visual Composite Score and Concentration Rating, in presence of visual perception and intelligence.	composite reading score	.679	.470	18.138	2/56	<.01
21.	Wepman Auditory Discrimination and Stanford-Binet Intelligence Scores, in presence of visual perception and concentration.	composite reading score	.679	.589	7.821	2/56	<.01
22.	Wepman Auditory Discrimination Score and Concentration Rating, in presence of visual perception and intelligence.	composite reading score	.679	.502	15.398	2/56	<.01

to the forecasting of reading achievement and answered by the appropriate regression equations. For example:

> Which single predictor, visual perception, auditory discrimination, intelligence scores or a concentration will best forecast primary reading achievement in the presence of the other variables?

The answer contained in Table VII, rows 14, 15, 16 and 17, is that in the present study, a five-point teachers' rating for concentration gives the best prediction for primary reading achievement. The next best predictors for end-of-grade-one reading prove to be visual perception, followed fairly closely by auditory discrimination. The probability of these three factors contributing significantly to prediction is better than the one per cent level of confidence. Last in order as an effective predictor of primary reading is the individual intelligence score ($p < .05$).

A further question was then posed:

> Which pairs of predictors in the presence of the other independent variables would best contribute to the forecasting of primary reading achievement?

Answers were provided by the construction of new linear equations, which restricted pairs of the predictor variables in turn. The results of the new regression analysis are presented in Table VIII, and answers to the question posed are found in rows 18, 19, 20, 21 and 22.

The pair of variables most strongly predicting reading achievement is a combination of visual perception, as measured by the composite D.T.V.P. score, and the concentration rating. The second best pair is a combination of auditory discrimination and the concentration rating. Both these pairs are better predictors of reading than either combina-

TABLE IX

REGRESSION ANALYSIS RESTRICTING COMBINATIONS OF THREE VARIABLES IN TURN FROM THE FOUR SELECTED PREDICTORS OF PRIMARY READING

Row	Predictors	Criterion	RSQ full	RSQ restricted	Difference	F Ratio	Degrees of Freedom	Probability
23.	Frostig Visual Composite, Wepman Auditory and Stanford-Binet Intelligence scores, in presence of concentration.	composite reading score	.679	.484	.194	11.282	3/56	<.01
24.	Frostig Visual Composite, Wepman Auditory Scores and Concentration Rating, in presence of intelligence.	composite reading score	.679	.321	.358	20.759	3/56	<.01
25.	Wepman Auditory, Stanford-Binet Intelligence Scores and Concentration Rating, in presence of visual perception.	composite reading score	.679	.408	.270	15.700	3/56	<.01

tions of visual and auditory perception, visual perception and intelligence, or auditory discrimination and intelligence. However, all possible couples of the four independent variables secure sufficiently high F-ratios to ensure probabilities better than the one per cent level of confidence.

A further question was then asked:

> Which triad of independent variables would best predict primary reading achievement in the presence of the remaining variable?

Regression equations were then constructed restricting in turn triads of independent variables to determine their joint contribution to the prediction of the reading scores. The answer to the question is presented in Table IX, rows 23, 24 and 25.

The most effective triad of predictors of reading achievement appears to be a combination of visual and auditory perception with concentration. This is a much superior combination to one of visual and auditory perception with intelligence. All possible triads secure sufficiently high F-ratios to rate probabilities beyond the one per cent level of confidence.

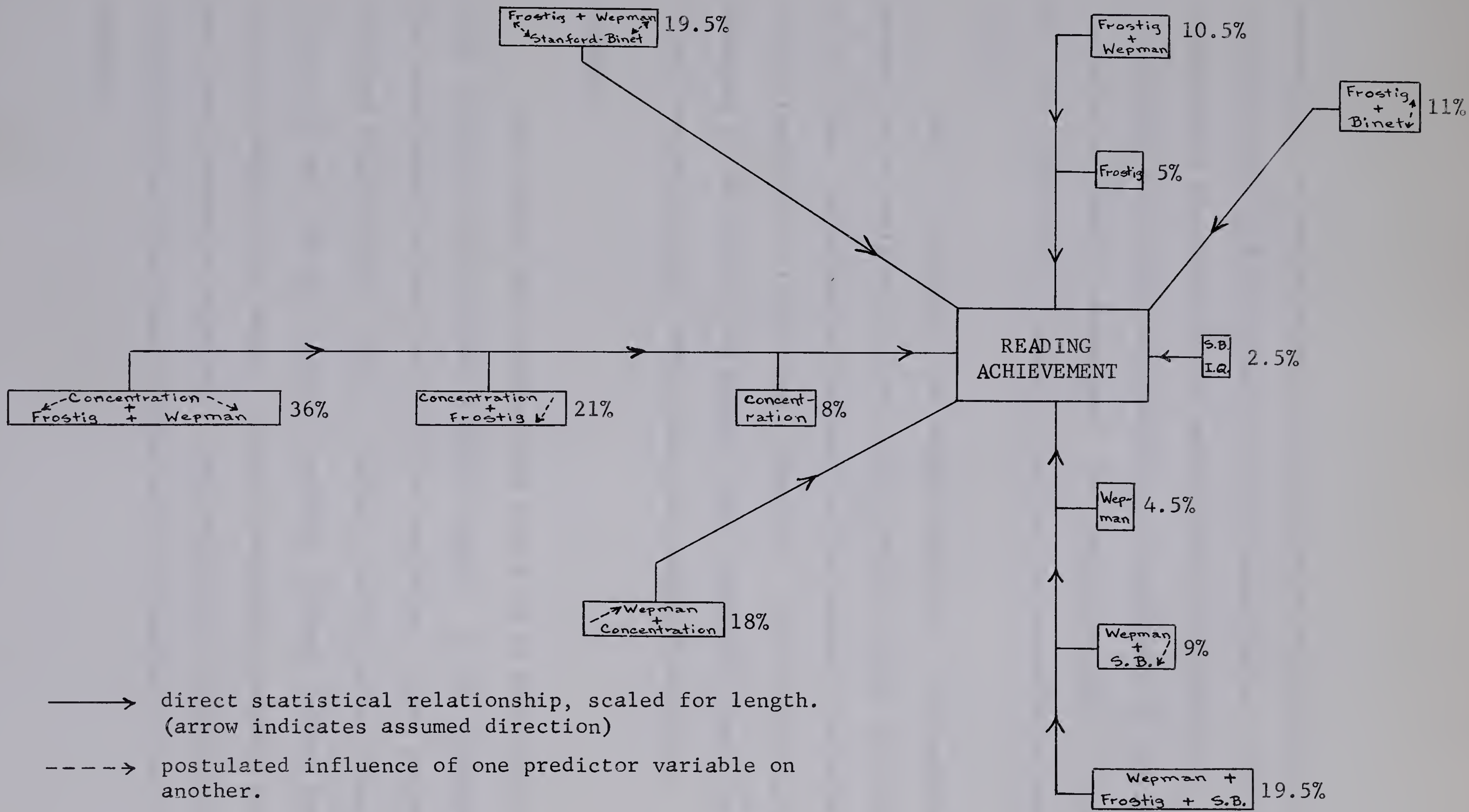
The results of the regression analysis confirmed and extended the conclusions drawn by comparing means and examining correlation coefficients. By the method of subtracting the multiple correlation squared (RSQ) for the restricted model from that of the full model, a decimal fraction was obtained which represented the reduction in predictive efficiency when a predictor variable was excluded in the presence of the others. This number was then converted to a percentage contribution by multiplying it by a hundred. For example, for the variable

concentration, $RSQ_f - RSQ_r = .7231 - .6938 = .0793$. Rounding off the last decimal figure, it may now be said that the variable concentration alone contributed eight per cent of the variance in reading achievement.

By restricting pairs of independent variables, the percentage contribution of two predictors could be computed, and similarly for three variables taken together.

By adding the composite D.T.V.P. score to the concentration rating, the predictive value rose to twenty-one per cent, and the further inclusion of the W.A.D.T. scores to thirty-six per cent. These three produced the best combination, and thirty-six per cent was the highest percentage of the total variance in reading achievement that could be predicted from the independent variables finally used in this study.

To what then, could the remaining sixty-four per cent of variance be attributed? First it should be noted that intelligence was excluded from the predictor battery discussed in the previous paragraph. The inclusion of this variable would no doubt considerably reduce the proportion of unattributed variance. Inter-correlations between the chosen variables contributed some of the remaining sixty-four per cent of variance. It was noticed that the simultaneous restriction of three variables produced a greater increase in predictive power than the sum of the contributions of the three variables taken separately. Apparently, by combining the effects of two or three predictors, the effect of inter-correlation was reduced, and the predictive value increased. It would not be unreasonable to postulate, for example, that an ability to concentrate would enhance performance on tests of visual and auditory



——→ direct statistical relationship, scaled for length. (arrow indicates assumed direction)

- - - -→ postulated influence of one predictor variable on another.

FIGURE 3

LOGICAL AND STATISTICAL RELATIONSHIP OF VARIABLES TO READING ACHIEVEMENT

perception, or that high ability in perception and concentration would correlate well with performance on intelligence tests. Nevertheless a considerable proportion of the variance was not accounted for. Figure 3 illustrates the logical and statistical relationship of the four predictor variables to reading achievement. The cumulative effect of combining two and three predictors is shown by plotting the variables to scale on one vector.

Some of the factors that might contribute to the unaccounted proportion of variance could be socio-economic status, the cultural level of the home, the affection displayed by the parents, the child's position in the family, and his emotional stability. Few of these can be easily assessed by the school, and perhaps their evaluation should be left to clinicians dealing with severe cases of reading disability.

Summary

This chapter has presented the data from an experimental study of sixty above-and below-average primary readers. It has attempted to show the relationship between the predictor variables, visual perception, auditory discrimination, aural vocabulary, intelligence, three personality traits and sex, and the criterion variable, primary reading achievement, through examination of means, standard deviations, multiple correlations and linear regression equations. The conclusions, implications and recommendations from these findings will be presented in the final chapter.

CHAPTER V

CONCLUSIONS, IMPLICATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

The purpose of this study was to investigate the inter-relationships between visual perception, auditory discrimination, aural vocabulary, intelligence, personality traits and primary reading achievement, in the hope of uncovering basic perceptual and personality differences that might account for the discrepancy in reading achievement of above- and below-average readers, with apparently no major physical, home, school or emotional factors that might contribute to reading deficiency.

From the hypotheses, conclusions are drawn and then discussed in the light of current research. Implications arising from the conclusions, together with suggestions for future research are presented.

CONCLUSIONS

Hypothesis I

There is no significant difference between the means of scores or ratings made by the group of above-average and the group of below-average readers on measures of visual and auditory perception, aural vocabulary, intelligence and personality, namely:

A. the D.T.V.P. sub-test I,
B. the D.T.V.P. sub-test II,
C. the D.T.V.P. sub-test III,
D. the D.T.V.P. sub-test IV,
E. the D.T.V.P. sub-test V,
F. the composite D.T.V.P.,
G. the W.A.D.T.,
H. the P.P.V.T.,

I. the S.B.,
J. concentration,
K. dominance/submissiveness and
L. persistence.

The null hypotheses I A, C, F, G, H, I, J, K and L were rejected.

These findings lead to the conclusion that above-average readers differ from below-average readers in many respects, in levels of certain aspects of visual perception, in levels of auditory discrimination and intelligence, in measures of three personality traits, but not in aural vocabulary. The findings of the present study are compatible with those of Malmquist (1958, p.25), who reported that at the end of the first year in school, differences in many factors are already evident in good, medium and poor readers.

When, however, children are in the average range of intelligence and possess no speech defect, their level of aural vocabulary is not a significant factor governing their ability to learn to read. This conclusion is in agreement with that of Harrington (1955, p.80), who suggested that most children come to school with a sufficiently adequate aural vocabulary to begin reading.

Examination of the means and standard deviations of each D.T.V.P. sub-test point to the conclusion previously advanced by Gates (1926) and Malmquist (1958, p.37), that visual perception is not a unitary ability, but rather composed of different aspects or specialized areas. Vernon (1958, p.30), has suggested that development in different areas may proceed at different paces, and vary according to the difficulty of material perceived. Evidence from the means and standard variations confirm Vernon's opinion. By the end of grade one, the majority of

children's powers of visual discrimination were sufficiently mature enough for them to be able in D.T.V.P. sub-test II to superimpose a simple geometric figure on a complex one, a task Ghent (in Vernon, 1960, p.10) reported is usually accomplished by the age of seven. They were also able in D.T.V.P. sub-test IV to detect reversals in simple geometric objects and pictures, a task that might have caused more difficulty a year earlier as Wheatley (1965) found.

Birch (in ed. Money, 1961, p.168), has postulated that past the stage of simple visual discrimination come levels of increasingly more complexity, those of perceptual analysis and synthesis, and that these more intricate levels are related to perception of the printed page. The task that most clearly differentiated poor readers from good readers in the present study was in the perception of form constancy in D.T.V.P. sub-test III. Here the children were required after a short exposure of a stimulus figure, for example a square, to detect repetitions of its shape, varying in size and position in space, and embedded in a distractible background. A task of this nature could be said to involve powers of analysis and synthesis as described by Birch. Furthermore it could be said to measure what Goins (1957), described as 'strength of closure,' where a stimulus has to be held in mind against distraction, and which she concluded to be significantly related to primary reading achievement.

In the present study, eye-motor coordination was not considered an integral part of visual perception, and so was held to be outside the bounds of this investigation proper, but it must be noted that the good readers' eye-motor coordination was considerably more developed than the

poor readers'.

Sufficient evidence came from the present investigation to indicate that not only visual perception, but also auditory discrimination develops considerably during the primary years. By the beginning of the grade two year, the good readers, unlike the poor readers, had matured sufficiently in auditory discrimination to pick up fine discriminations in common phonemes.

Although an attempt was made to minimize the role of intelligence in this study by only including children within the average range of intelligence on a group-test, results showed a significant difference of means between the intelligence of good and poor readers, when measured by an individual score, so intelligence does appear to have a significant relationship with primary reading success. The extent of significance will be discussed more thoroughly in the next section.

Perhaps the most interesting conclusion from this study is that certain personality traits have significant relationships with reading achievement. Although, because of the type of rating scale used, the standard deviations were small, the good readers do have more favourable personality characteristics than the poor ones. This finding is in agreement with opinions expressed by Strang (1964, pp.596-599), and Piaget (1962, p.130).

<u>Hypothesis II</u>

There are no significant correlations between the combined E.W.R. and P.P.R. scores and measures of visual and auditory perception, aural

vocabulary, intelligence, personality and sex of subject, namely:

A. the D.T.V.P. sub-test I,
B. the D.T.V.P. sub-test II,
C. the D.T.V.P. sub-test III,
D. the D.T.V.P. sub-test IV,
E. the D.T.V.P. sub-test V,
F. the composite D.T.V.P.,
G. the W.A.D.T.,
H. the P.P.V.T.,
I. the S.B.,
J. concentration,
K. dominance/submissiveness,
L. persistence and
M. sex of subject.

After examination of the multiple correlation coefficients, the null hypotheses in the case of II A, C, F, G, I, J, K, L and M were rejected.

The findings from Hypothesis II reinforce and refine the conclusions gained from Hypothesis I. It is not only apparent that several factors have significant relationships with primary reading achievement, but the relative significance of each factor becomes discernible through the magnitude of its correlation with the reading score.

Visual perception now emerges as a highly important factor in determining grade one reading success, a little more important than auditory discrimination, and rather more than intelligence, although all three are significant. The findings from the present study indicated that the composite D.T.V.P. score provides a high correlation with reading (.615 $<$.001), better than any separate D.T.V.P. sub-test score. Examination of the sub-test correlations with reading re-affirms the conclusions drawn from Hypothesis I, that the development of visual perception proceeds at different rates in different areas, and that by

the end of grade one a successful reader has attained not only a fairly complex level of discrimination, but can hold a figure against distraction. D.T.V.P. sub-test III, testing the ability to perceive form-constancy, again demonstrates its high relationship with reading achievement by its significant correlation (.445 <.001).

The findings from Hypothesis II showed that intelligence enjoys a significant relationship, though less than those of visual and auditory perception and personality traits with primary reading achievement. The majority of investigators into factors influencing end of grade one reading scores have employed group intelligence measures with varying results.

The investigation which can most easily be compared with the present study is that of Malmquist (1958), where a Swedish translation of the second revision of the Stanford Binet Intelligence Test (1930), was employed to give an individual measure. Malmquist reported correlations between intelligence and silent reading that were positive (.50 and .42), but not as high as in the present study, (.536). A general trend apparent in the research, into which the present investigation seems to fit, is that at the end of grade one, a child's intelligence may be a significant factor governing how he reads, but there are many other factors which may have greater significance.

For example, in the present study, the level of auditory discrimination attained by a child at the end of grade one has a slightly higher correlation (-.571 <.001) with his reading achievement than does his intelligence (.536 <.001); so, as Wepman (1960) and Reid (1962) have

have pointed out, auditory discrimination is an important factor for success in primary reading.

The findings from Hypothesis I showed that, along with other factors, good readers differ from poor readers in personality traits, but the strength of the personality factor is not fully displayed until correlations are examined in order to test Hypothesis II. It is then seen that, while all three traits, concentration, dominance/submissiveness and persistence have very high correlations with reading (-.696, -.557 and -.577 respectively $<.001$), the rating for concentration enjoys the highest correlation with reading of any variable in the study. These findings are compatible with those of Malmquist (1958), who reported correlations of a slightly less magnitude.

Further evidence of the strength of the concentration trait is demonstrated by its correlations with visual perception (-0.522), intelligence (-0.470), and auditory discrimination (0.450), which are higher than those variables enjoy with any other except reading. Auditory discrimination appears to be relatively more independent of concentration than visual perception and intelligence, but this may be due to the comparative brevity of the Wepman Auditory Discrimination Test compared with the longer visual and intellectual batteries. Even so, concentration has a significant relationship with auditory discrimination, and it might be speculated that like visual perception, auditory perception may have levels of analysis and synthesis, and particularly require 'strength of closure,' where the memory of a sound must be held against distraction, for as Vernon (1958) has suggested, it is vital to attend, for "auditory

stimuli, once lost, are gone forever." (p.61)

Caution must be exercised, however, when considering the value of the personality factors, as they were measured by teachers' ratings which are of necessity subjective, liable to be influenced by halo effects, sex bias or prejudice. Furthermore, there appears to be no satisfactory way to test reliability or validity of this measure.

Due to the design of the study, requiring an equal number of male and female above- and below-average readers, sex of the subject is not related significantly to the reading achievement, but it must be noted that in this study, poor male readers were not significantly inferior to poor female readers in reading achievement, visual or auditory perception. However, in the good reader group, the boys did read better than the girls.

The very low correlation of aural vocabulary (.157) with reading achievement confirms the conclusion, gained from its insignificant difference of means between good and poor readers, that aural vocabulary is not an important factor in primary reading.

To summarize up to this point, of the many factors which influence reading achievement, this study has shown that personality traits, particularly concentration, visual perception, auditory discrimination and intelligence each have highly significant relationships with primary reading achievement.

In order to assess the relative contribution of each of these variables to reading achievement and to attempt to find a battery of tests which would best predict a primary child's success in reading,

multiple linear regression equations were constructed to test the following hypotheses. They will be discussed together.

Hypothesis III

There is no contribution to the prediction of the combined E.W.R. and P.P.R. reading score, over and above the remaining variables still retained in the model, by restricting in turn:

A. the composite D.T.V.P. score,
B. the W.A.D.T. score,
C. the S.B. score and
D. the concentration rating.

The null hypotheses III A, B and D were rejected ($p < .01$).

The null hypothesis III C was rejected ($p = < .05$).

Hypothesis IV

There is no contribution to the prediction of the combined E.W.R. and P.P.R. reading scores, over and above those variables still retained in the model, by restricting in turn, the following pairs of predictors:

A. the composite D.T.V.P. and W.A.D.T. scores,
B. the composite D.T.V.P. and S.B. scores,
C. the composite D.T.V.P. score and the concentration rating,
D. the W.A.D.T. and S.B. scores and finally
E. the W.A.D.T. score and the concentration rating.

The null hypotheses IV A, B, C, D and E were all rejected ($p < .01$).

Hypothesis V

There is no contribution to the prediction of the combined E.W.R. and P.P.R. reading score, by restricting, in turn, over and above the variable still retained in the model, the following triads of predictor variables:

A. the composite D.T.V.P., W.A.D.T. and S.B. scores,
B. the composite D.T.V.P. and W.A.D.T. scores with the concentration rating,

C. the W.A.D.T. and S.B. scores with the concentration rating.

The null hypotheses V A, B and C were all rejected. ($p < .01$)

It could be said that all evidence in this study is cumulative. The findings from the first two hypotheses show that several factors, visual perception, auditory discrimination, intelligence and personality traits influence how a child reads at the primary level. The data from the last three demonstrate that a battery of tests rather than one single measure best predicts primary reading achievement. In this investigation, a combination of The Marianne Frostig Developmental Test of Visual Perception, the Wepman Auditory Discrimination Test, and a teacher's rating for a personality trait, concentration, provided the best prediction for the end of grade one reading score. Many researchers have mentioned the importance of visual and auditory perception in primary reading. In addition to auditory and visual discrimination, Sister Nila (1953, p.548) listed range of information and mental age as four necessary requisites for success in beginning reading. The evidence from the present study shows that if a measure of concentration rather than a measure of individual intelligence is combined with visual and auditory perceptual scores, a better prediction of reading is achieved.

LIMITATIONS OF THE FINDINGS OF THE STUDY

1. The population from which the sample for this study was selected consisted of the grade one students registered in the public schools of the city of Edmonton, Alberta, Canada, for the year 1964-65. The sample was not randomly selected from the available population.

Because an attempt was being made to study only some of the factors affecting reading achievement, restrictions were placed on the selection of the sample with the aim of reducing the effect of other variables. Pupils selected were matched in respect to sex, school, freedom from gross physical and emotional handicaps, as near as possible to group intelligence scores and in twenty-five out of thirty pairs to the same grade one teacher.

2. The selected sample was stratified with respect to reading achievement. Consideration of the means and standard deviations of all other variables indicate that these were normally distributed.

3. A preliminary attempt was made to reduce the correlation of intelligence with reading achievement by restricting the population to the normal range of intelligence, ninety to one hundred and twenty I.Q. points as measured on the Detroit Beginners Intelligence Test. Subsequent individual Stanford Binet ratings considerably extended the range of intelligence scores.

4. The discriminatory power of The Marianne Frostig Developmental Test of Visual Perception, particularly with respect to sub-tests II, IV and V, appears to diminish with increasing age. Its peak of effectiveness is probably reached at the beginning of the grade one year.

IMPLICATIONS

1. Preliminary eye and ear screening revealed that approximately one in every eleven potential subjects had a hearing deficiency, while one in every nine had a visual defect, all previously undetected. Improved

visual screening together with an individual audiometric check at the grade one level might lead to fewer learning casualties.

2. Sex of the subject was not under investigation in this study. It was noted, however, that in the above-average reader group, the boys read better than the girls, and also that there were no significant differences in levels of auditory and visual perception between boys and girls. Perhaps factors, other than immaturity in perception, account for the preponderance of male remedial readers. One might postulate that in this present culture boys are far more active than girls, and so an activity program might cater more to their needs than a remedial program geared to improve specific visual and auditory perceptual deficiencies.

3. On the other hand, two aspects of visual perception appear very important to success in end of grade one reading. The findings in this study support the thesis advanced in Chapter II, that by the end of grade one most children's powers of visual perception are becoming increasingly more mature. It was suggested in Chapter II that visual perception might be considered as a series of hierarchical levels beginning with simple visual discrimination, continuing through visual analysis and synthesis, and finally arriving at retention through strength of visual closure. It might be conjectured from the findings of the D.T.V.P. sub-tests, that by the age of seven, almost all children in the average range of intelligence have progressed through the first stage of simple visual discrimination, and the majority through the second stage, that of visual analysis. It is only in the last two stages, and particularly in the final one of strength of visual closure (D.T.V.P.

sub-tests III and V), where good readers emerge as significantly superior to poor readers. Exercises to encourage visual memory, to hold in mind letters and words against distraction, might be more beneficial than the simple matching exercises commonly found in primary workbooks.

4. The second aspect of visual perception which appears to have matured in good readers but not in poor ones is that of eye-motor coordination, demonstrated in D.T.V.P. sub-test I. It is easier to see a direct link between eye-motor coordination and handwriting rather than reading. Perhaps poor eye-motor coordination is a symptom of a general immaturity of fine neurological integrations, one form of which must be used for reading. It might also be conjectured, as de Hirsch (1957, p.567) did, that maturity comes through increasingly finer and more complex integration of neural systems. It might than be implied that muscular coordination be viewed as a continuum extending from gross to increasingly finer coordination, and that additional measures to test gross coordination be used if eye-hand coordination is shown to be defective by D.T.V.P. sub-test I, so that specific remediation may take place at the level of need. For example, weakness in gross muscular coordination might be more suitably remedied by activity lessons, such as daily physical education employing big movements, while immaturity in finer eye-hand coordination might require additional training in finer skills, such as paper-sculpture, rather than confining remediation to visual and auditory discrimination of printed words.

5. It has been shown that the Wepman Auditory Discrimination Test differentiates between good and poor readers at the end of grade

one. This finding supports Wepman's theory that auditory perception has not a unitary aspect, but is composed of different areas, acuity, understanding, discrimination and retention, each of which develops within itself at its own pace. It appears that in the present study, that children who can read well have already reached a fairly complex level of auditory discrimination. Wepman's test only measures short-term retention, so perhaps it might be advantageous to supplement the Wepman Auditory Discrimination Test with further measures to assess auditory memory, including strength of auditory closure.

It is further suggested that it might be possible to modify the Wepman Auditory Discrimination Test for administration with small groups by means of a clearly designed answer sheet, and the use of a tape-recorder, which would probably increase test-reliability, and preserve fidelity of sound. In this way children with potential reading problems might be identified during the grade one year by the teacher and given remediation through graded listening exercises at this early stage.

6. The ability to concentrate has been shown to correlate highly not only with reading achievement, but visual and auditory perception and intelligence. It might be implied that the inclusion of many informal games to improve concentration in the primary program might produce not only better reading but an all round improvement in mental alertness in all subjects. These games would stress intensive visual or auditory attention for at first very short periods of time which would gradually be lengthened.

7. Teachers' ratings of personality characteristics correlate

very highly with reading achievement. It seems possible that teacher-observations over a period of time, guided by carefully constructed check-lists, and recorded on well-structured rating scales, might give more valid assessments of progress in reading rather than reliance on scores of group tests which are only records of isolated observations.

SUGGESTIONS FOR FURTHER RESEARCH

1. It is hoped that the findings of this study be now tested with a larger population in which reading achievement is normally distributed.

2. It is recommended that a study be made investigating the relationship of visual and auditory perceptual abilities, a) at the beginning of the grade one year and, b) at the kindergarten level with end of grade one reading achievement.

3. A study might be made to investigate the value of teachers' ratings, particularly at the kindergarten and beginning grade one level with a view to early diagnosis and remediation of, a) perceptual and, b) personality deficiencies.

4. Research programs to test the effectiveness of remediation on specific visual and auditory perceptual weaknesses might be advantageous at the kindergarten and primary grade level.

5. The technique of multiple linear regression is a powerful technique which might be used to assess the relative importance of other major factors contributing to primary reading achievement, for example, cultural level, sex of subject or fatherless homes.

CONCLUDING STATEMENT

The present investigation examined the inter-relationships of visual and auditory perceptual, intellectual and personality factors with primary reading achievement. Few investigators up to the present have studied the relative contribution of several factors to reading achievement through the technique of multiple linear regression analysis. Only one other investigator (Malmquist, 1958) has considered the relationship of personality and perception with primary reading, and he did not include auditory discrimination together with visual perception as was done in the present study. It was found that significant relationships exist between several factors, perceptual, intellectual and personality, and reading achievement at the end of grade one. A battery consisting of <u>The Marianne Frostig Developmental Test of Visual Perception</u>, the <u>Wepman Auditory Discrimination Test</u>, and a teacher's rating for personality traits, particularly concentration, would seem to have merit for diagnosing perceptual and personality weaknesses which might underlie primary reading deficiencies. These measures could be used by classroom teachers, and point the way to specific and speedy remediation.

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APPENDICES

DETROIT
BEGINNING FIRST-GRADE INTELLIGENCE TEST
(*Revised*)

By ANNA M. ENGEL, Assistant Director, Special Education, Detroit Public Schools,
and HARRY J. BAKER, Director, Psychological Clinic, Detroit Public Schools

No. of Test	Score
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

Last name.................. First name.................. Initial. . . Sex: M. . . F. . .

City...................... School...................... Birth date.............

Rating.................... Mental Age.................. IQ.................

EXAMINATION: FORM A

Test 1

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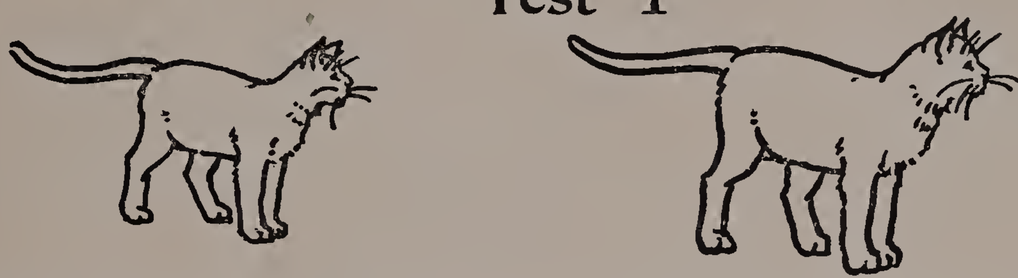

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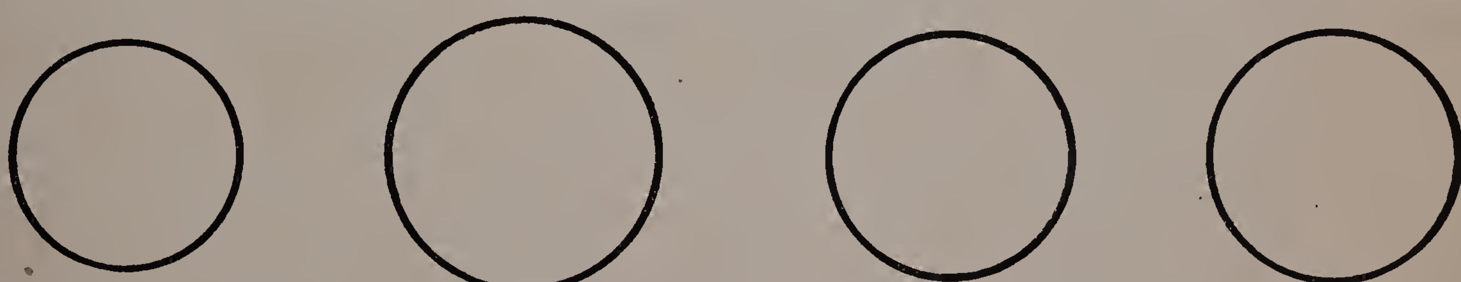

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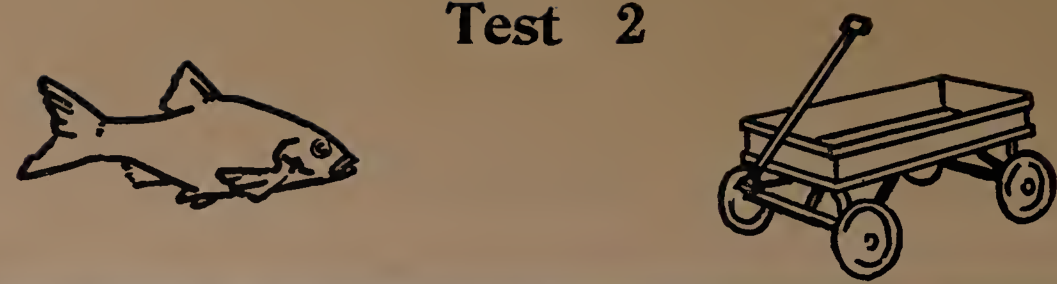

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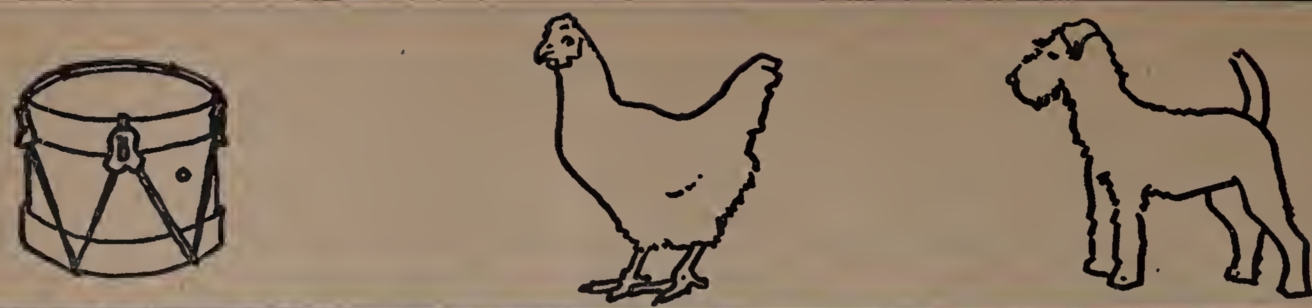

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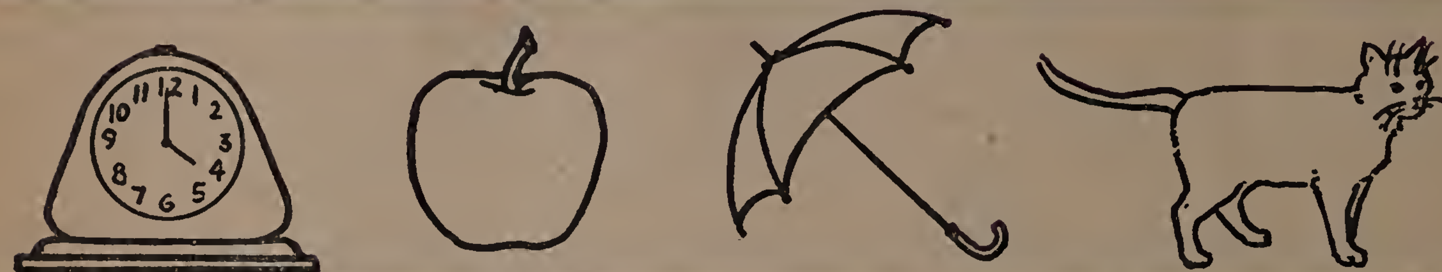

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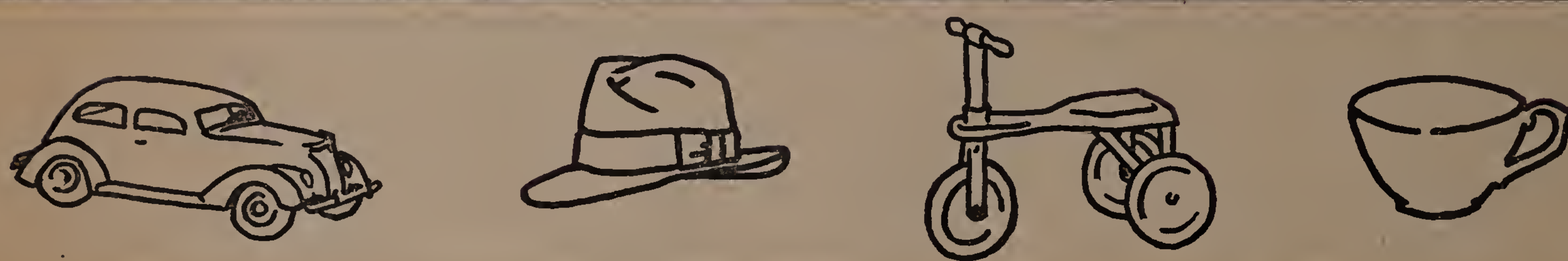

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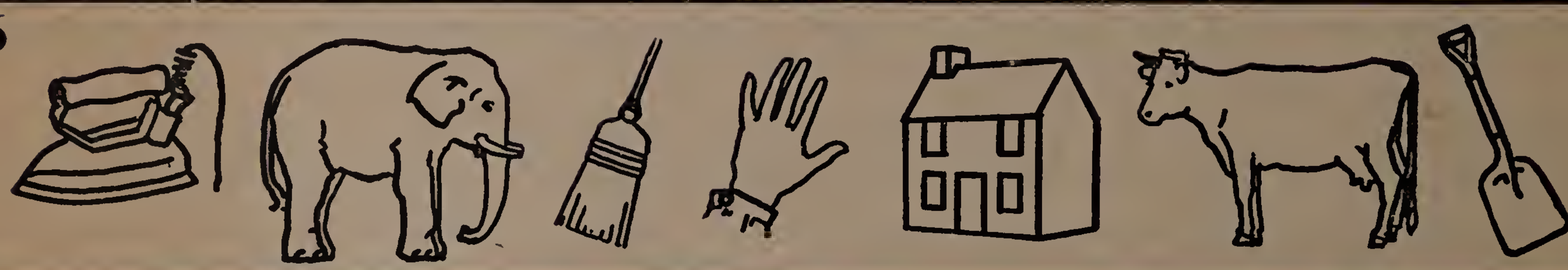

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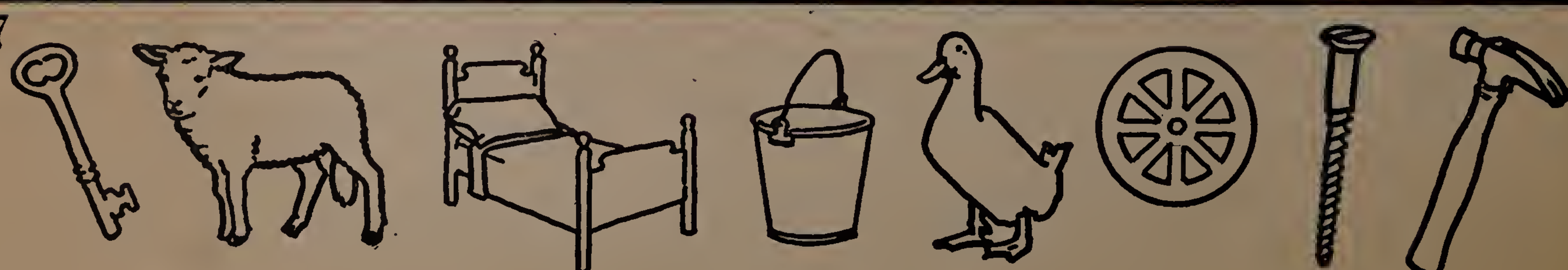

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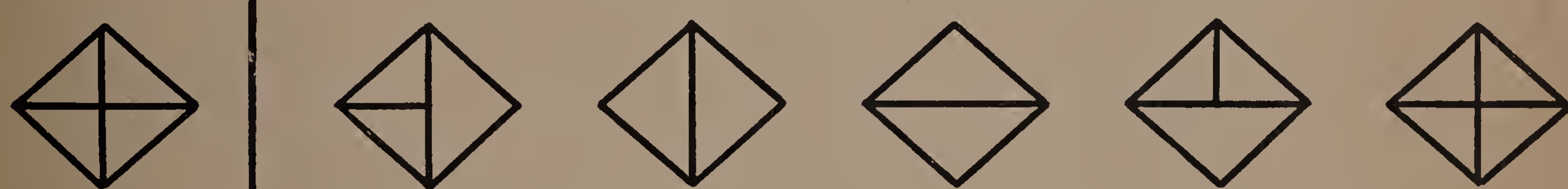

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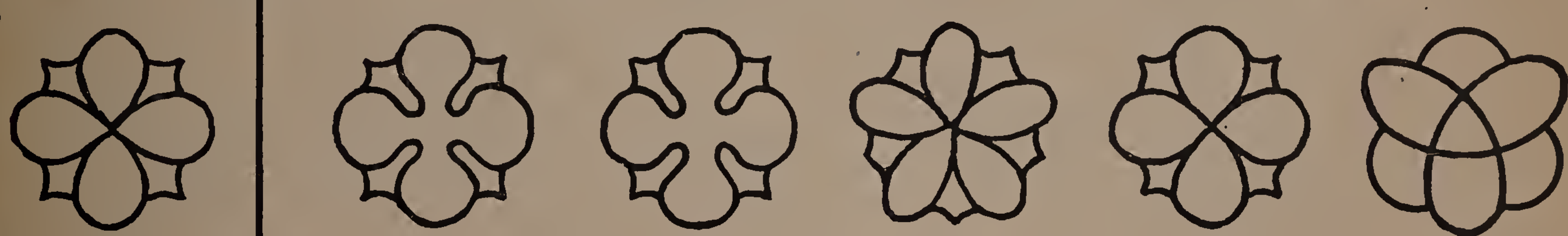

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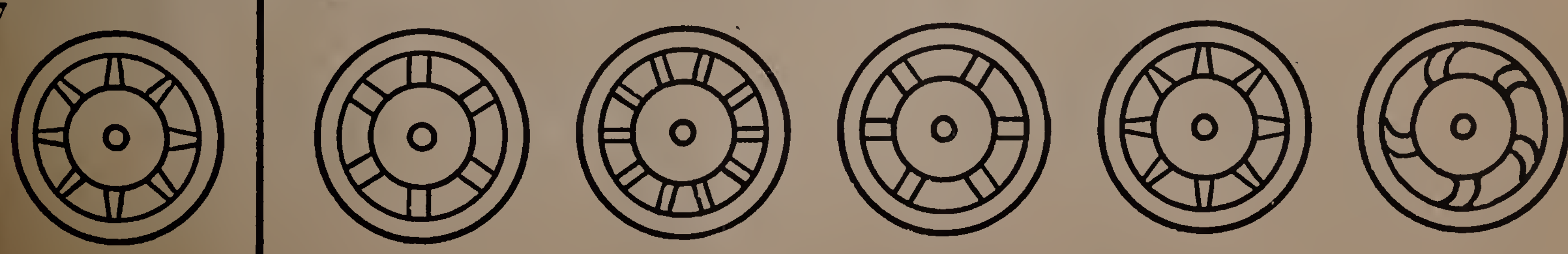

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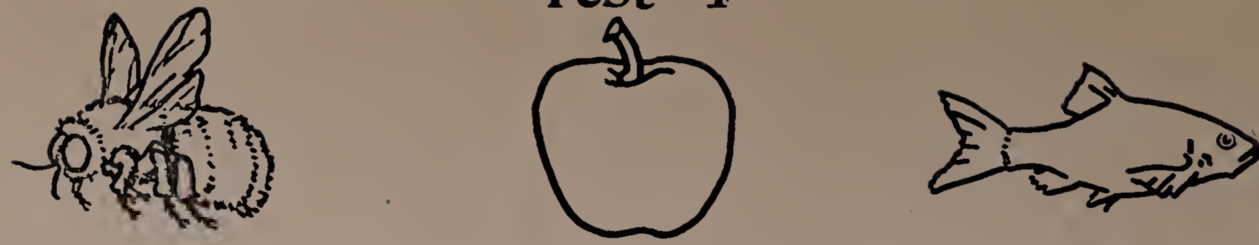

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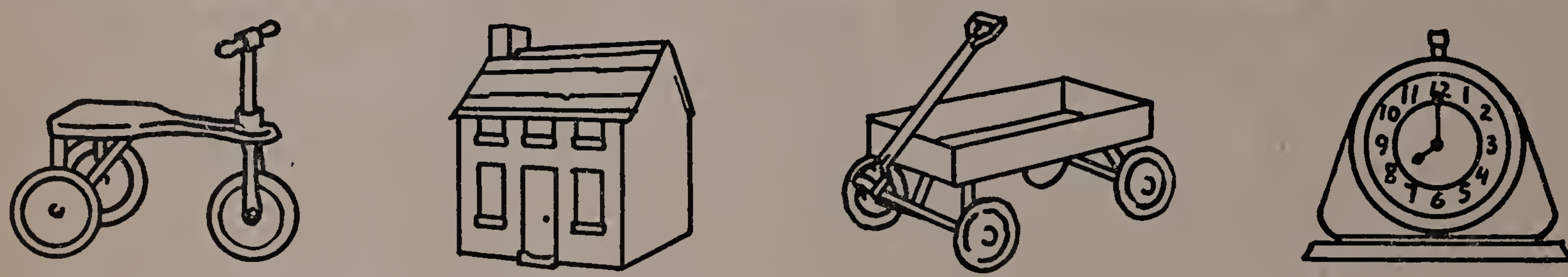

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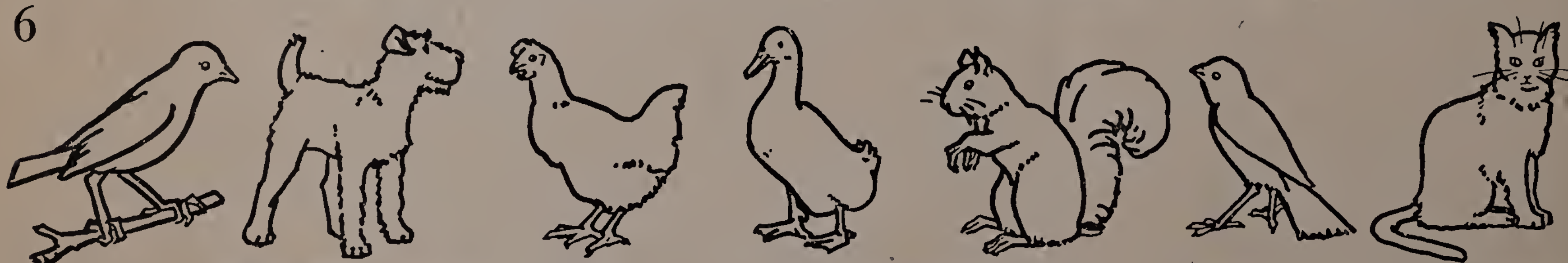

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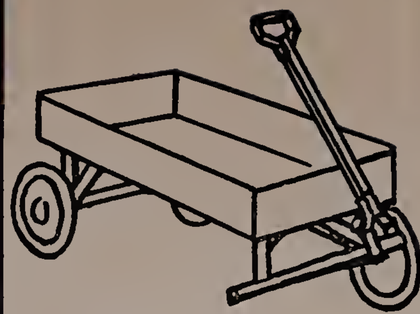

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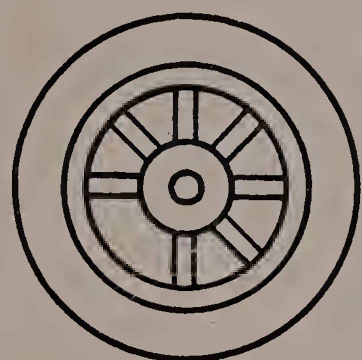

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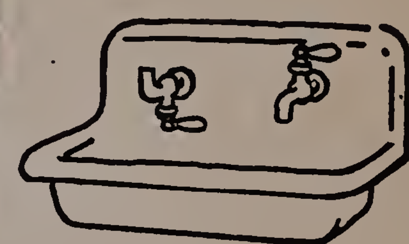

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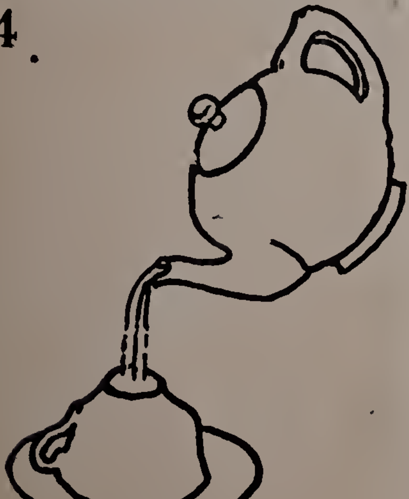

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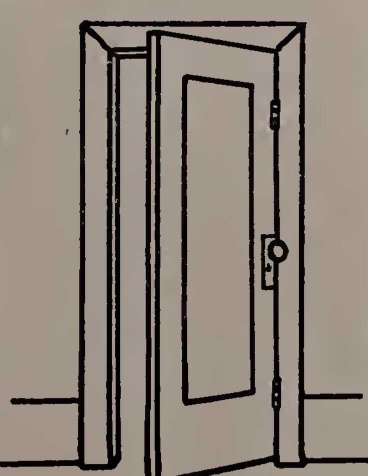

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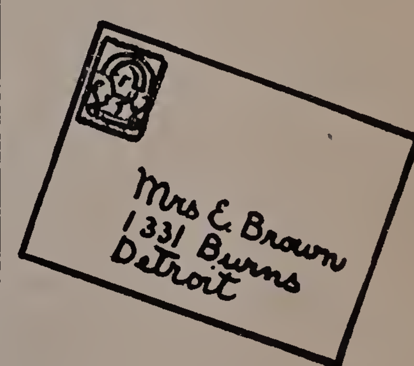

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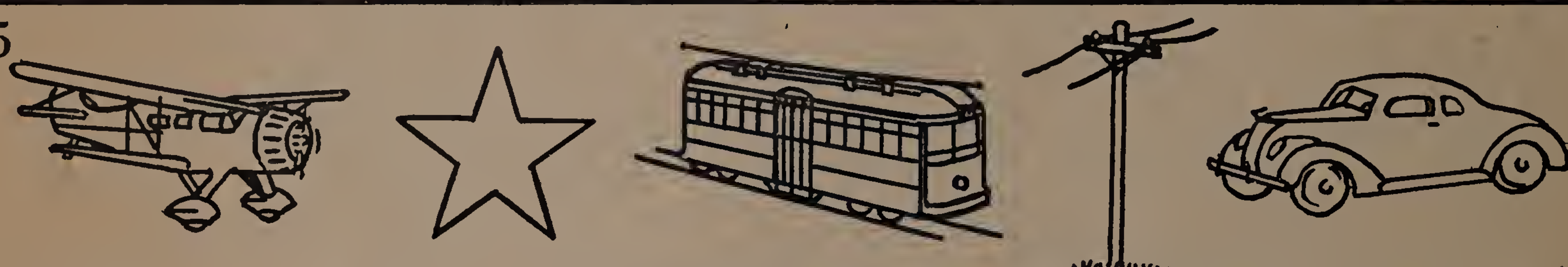

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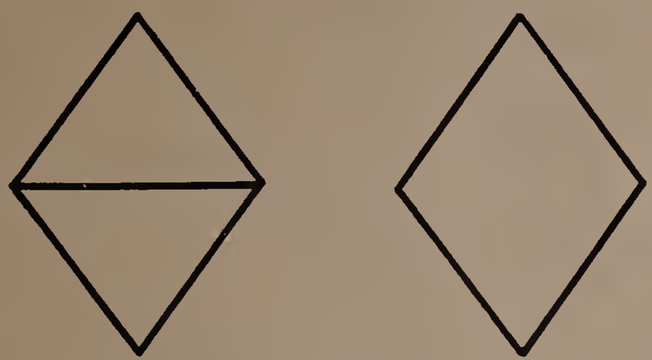

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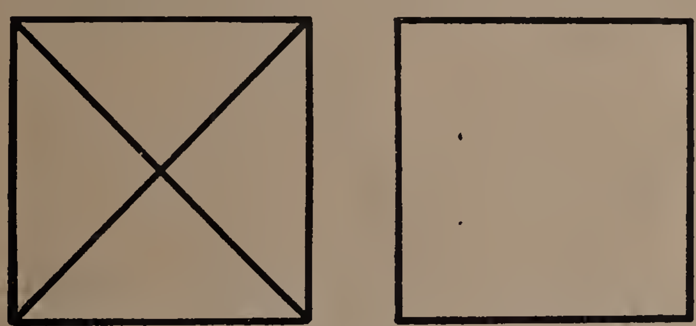

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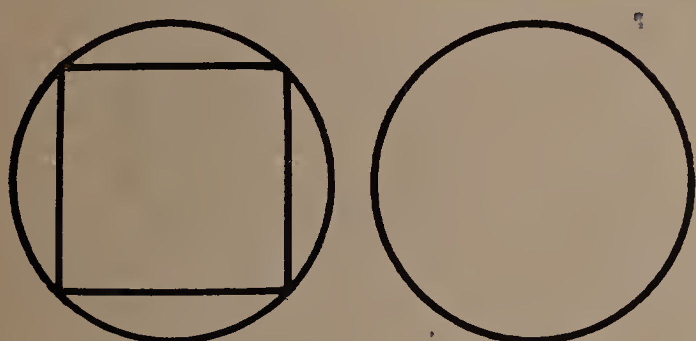

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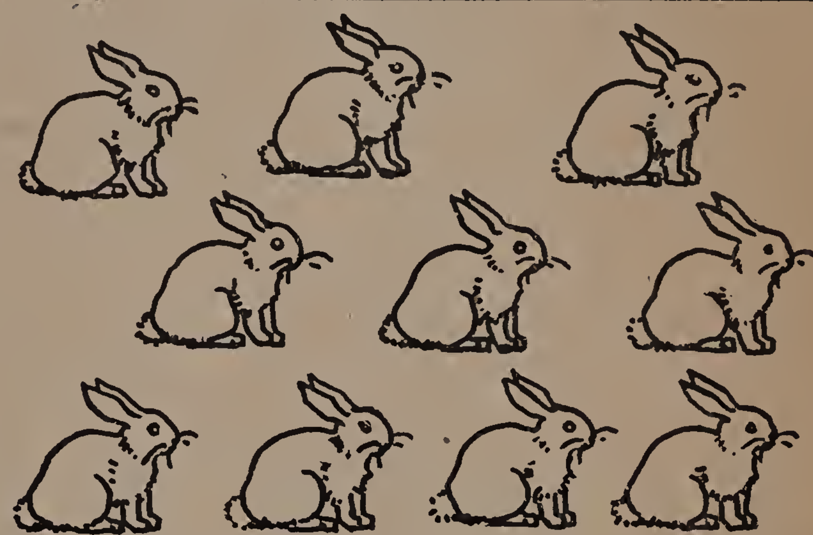

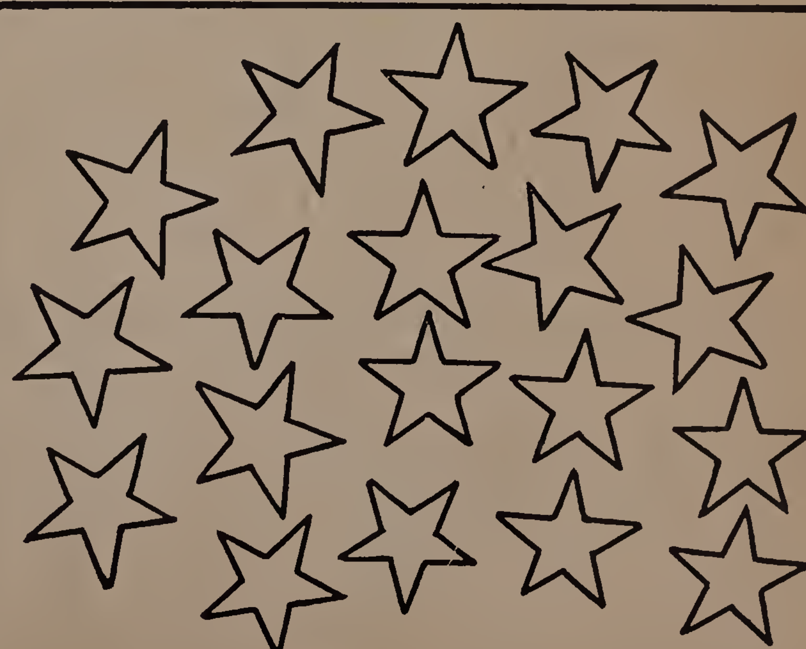

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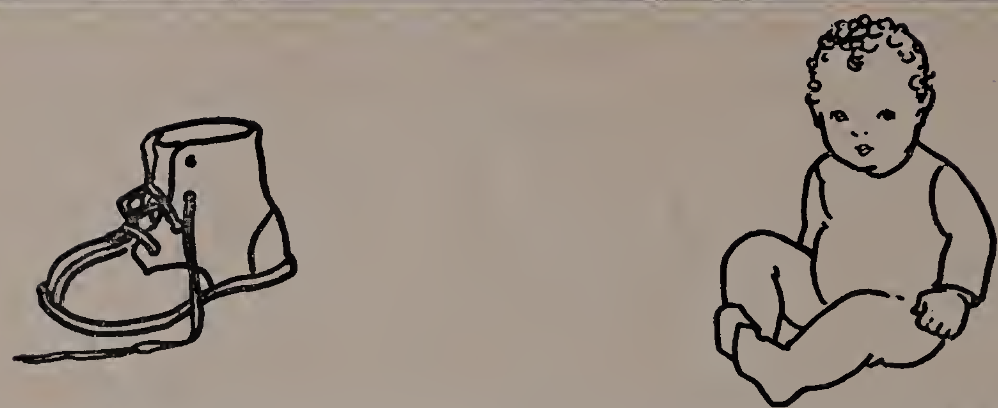

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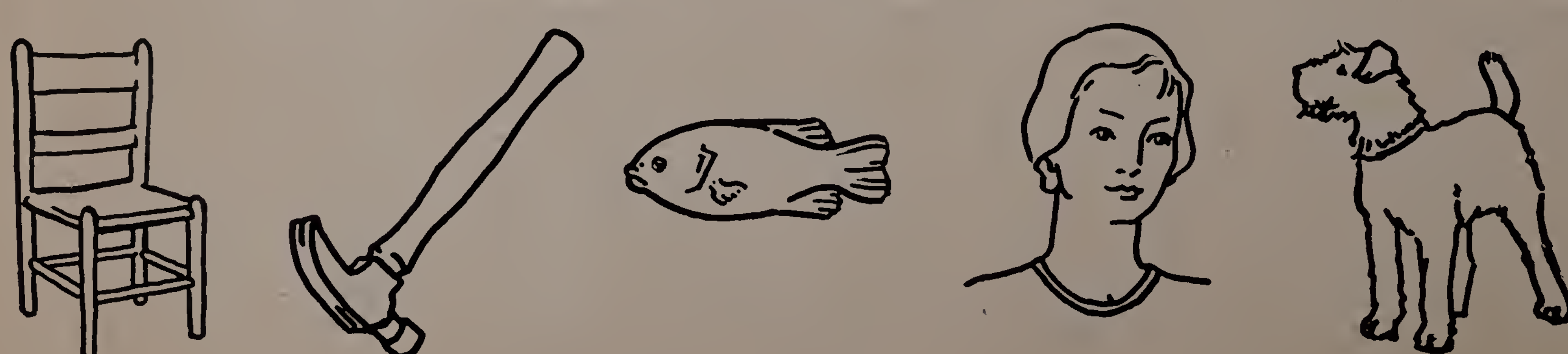


Score ......

ATES PRIMARY READING TEST

TYPE PPR

FORM 2

r Grade 1 and Grade 2 (First Half)

ype PPR. Paragraph Reading

BUREAU OF PUBLICATIONS • TEACHERS COLLEGE • COLUMBIA UNIVERSITY
525 West 120th Street, New York 27, N. Y.

rite your name here..

ow old are you?..............................When is your birthday?..

hool...Grade.......................Date...

1. Put an X on the ball.

2. Put an X on the milk bottle.

3. Draw a line under the little book.

4. Draw a line from the pig to the tree.

the teacher: Detailed instructions for administering and scoring this test are given in the Manual (included in each test package).

mber tried..................................(possible 26)

Raw score (number of sentences correct).............................

ding grade..............................

Reading age...............................

sure to signal **STOP** at the end of **20** minutes.

Printed in U.S.A.

1. Put an X on the baby.

2. Put an X on the hat.

3. Draw a line under the big hen.

4. Draw a line under the black cat.

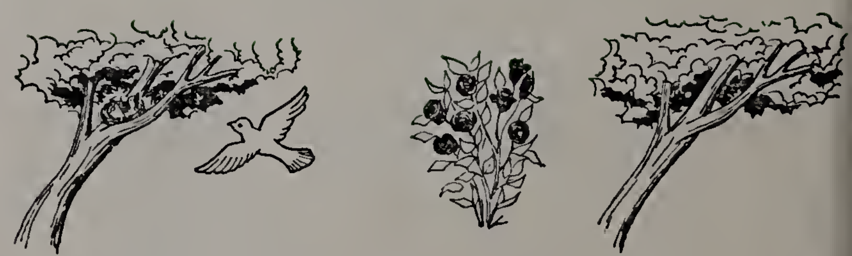
5. Put an X on the horse that is running a race.

3 **8** 8

6. Draw a line under the eight that is big.

7. Draw a line under the kitten that is playing with a mitten.

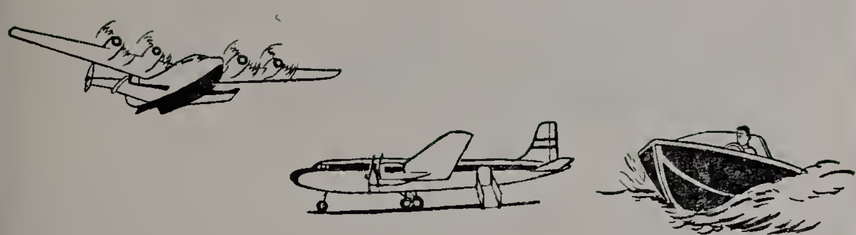
8. Put an X on the piece of white cake.



9. Put an X on the tree to which the robin is flying.

10. Draw a line under the doll on the chair.

11. Put an X on the boy who is fishing by the side of the brook.



12. One of these airplanes is in the air. Put an X on the one that is flying.

13. An elephant is bigger than a tiger, and a tiger is bigger than a monkey. Make an X on the elephant. It is the biggest.

14. The pony likes oats to eat. Draw a line from the pony to the oats.

15. "Always brush your teeth after eating," said the teacher. Draw a line under the child who is doing what the teacher told him to do.

16. Every morning the children go to school. The bus stops for them at the corner. Draw a line under the thing in which they will ride.

17. Here are ten little Indians. Draw a line under the feet of five of these Indians.

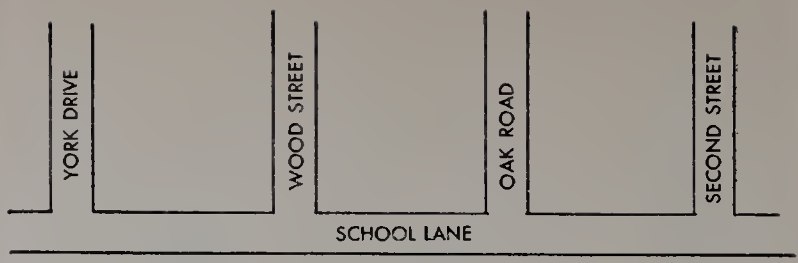
18. When the children go to camp, they carry several blankets. Draw a line under what they always take to camp.

19. The children are waiting for grandfather. The train goes by them and comes to a stop. "There he is," they shout. Draw a line from him to the children.

20. A boy wanted to send a letter by air mail. The postman told him he must buy an air-mail stamp. Draw a line from the stamp to the boy who is going to use it.

21. The ladder is leaning against the burning building. One fireman is climbing up. Draw a line from him to the place where you see some fire and smoke.

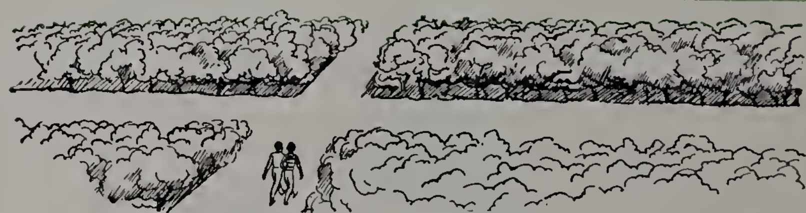
22. In the morning Father leaves for the office. He walks to the station to take the train. Look for the station in the picture. Draw a line under it.



23. The bank is on School Lane between Wood Street and Oak Road. Put an X where the bank is.

24. A boy had gone fishing with his father. It was such fun to row out on the pond and fish. All of a sudden, the boy cried, "I have one, a big one!" and jerked at his line. Make an X on what the boy caught.

25. The race is about to begin. The boys are "ready" on their mark. They cannot start until the teacher blows the whistle. Put an X on what the teacher will blow.



26. A boy and his playmate were going to the woods. They were going to swim in the lake. Mother said, "Be sure to turn right at the crossing." Draw a line showing which way the boys should turn.

WORD RECOGNITION TEST
E.P.S.B. 1964

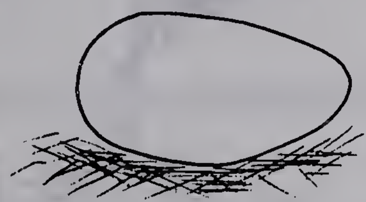
Grade One Final

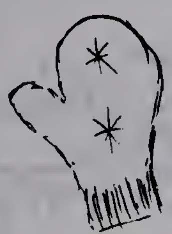
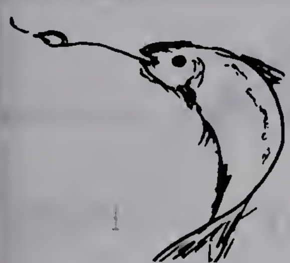
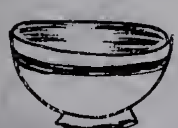
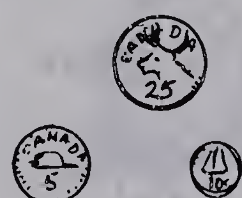
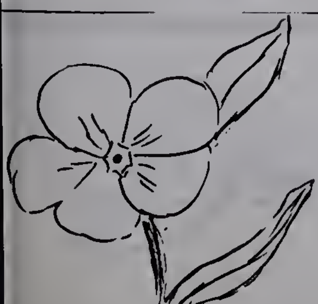
Name of Pupil . . . . School . . . .

Part A. Word Recognition. Sample Exercise

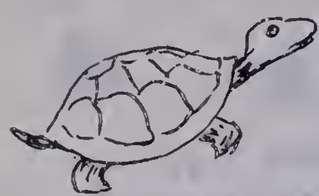
What is this picture? Yes, it is the picture of an egg. Now find the word 'egg' and draw a ring around it If you mark the wrong word draw a wavy line (~~) through it and draw a ring around the word that says "egg".

(Make sure that all pupils understand the directions and mark egg)

	eat	doll
	egg	get

	kitten	king	6. 8	night	either
	mitten	milk		eight	laugh
	working	flying	7. 	six	sled
	fishing	wishing		sleep	sleeve
	first	drive	8. 	stay	story
	dress	cause		store	shall
	book	owl	9. 	children	many
	bowl	low		money	month
	after	flower	Score (9) _______		
	church	floor			

10



tiny think
turtle turkey

11.

footstool footstep
footprint football

12

your quick
girl quack

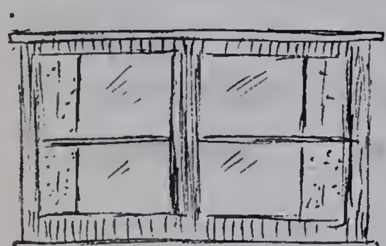
13.

sparrow barrel
squirrel spread

14.

round rubber
rolled robin

15.



wind meadow
open window

16.

marker laughter
light ladder

17.

milked walking
waking talking

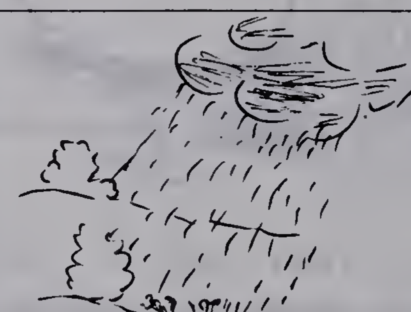
18.

sprinkle sparkle
sparrow startle

19

father foolish
faster feather

20

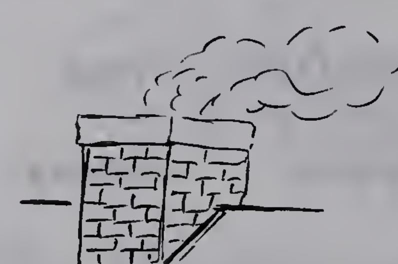


shower should
number shouted

21

feather finger
think fireplac

22

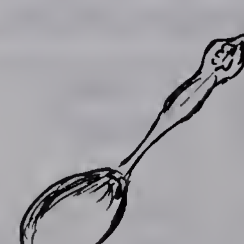


chicken children
chimney choose

23.

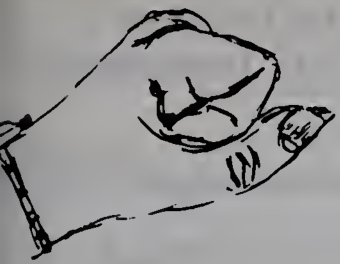
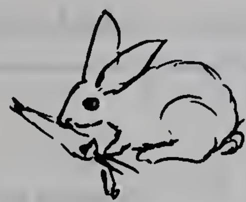
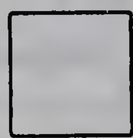
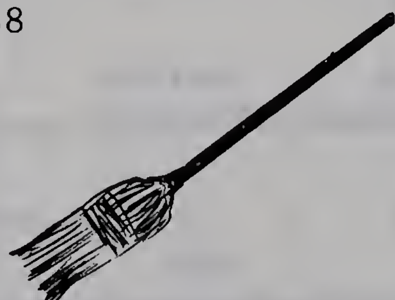
button broken
bread butter

24



soon spoon
speak moon

Score (15) ________

 fish fist find first	33  pudding pumpkin wading padding
 animal ant after answer	34.  upset insect inside section
25 window number winter month	35.  nine necklace riddle nibble
 friend fry fruit fence	36.  square enter smoke spring
 candy cannot carrot carried	37.  bridge charge bright escape
 nest number nurse necklace	38  sweet swing steam sweep
 watch where witch catch	39  smith miles while smile
 four flew walk blew	Score (15) __________ Total Score (39) __________ Total Correct ___ - 1/3 no. wrong= _____ Net Score ________ x 2 = $\boxed{}$

Part B. Vocabulary: Read the sentences. Look at the words. Which word finishes the sentence? Draw a ring around the right word. Do them in order.

Sample: Tom can get the . . . . .

here and ball

1. Yellow is a . . . . mouse birthday color	12. Some clowns are in the . . . . . . tape ranch circus
2 You hurry to go . . . . over about fast	13 The lions . . . . flash roar crow
3. You plant flowers in a . . . . . . letter garden tractor	14. Grass grows in the . . . . . ground kitchen mailbox
4. You hear a . . . . noise pole feather	15. If he is not tall, he is . . . . . . hungry short hot
5. A sled can go over the . . . . snow window school	16. The dog shook himself and . . . . whistled frightened howled
6. You build a house with a . . . . . . raccoon hammer donkey	17 You put boots on your . . . . . feet meat head
7. You eat breakfast in the . . . . track morning parade	18. Ice cubes are wet and . . . . slippery proud rumbling
8. You earn money to . . . . dig crawl buy	19. You paddle a . . . . bridge garage canoe
9. A furnace is a big . . . . bed stove cellar	20. A locomotive is run by the . . . . . . captain engineer conductor
10. The first one wins the . . . . cage song prize	21. Damp soil is . . . . moist contented embroidere
11. An elevator goes down to the. . . . . . basement pilot beaver	22. A sword is made of . . . . thunderbolt wilderness metal

Time: 10 minutes

(September 1964)

Score 1 each _______

GRADE ONE FINAL ARITHMETIC TEST

SCHOOL ______________________________ GROUP ____________

NAME ______________________________ Total Mark ____________

1. BASIC FACTS

(a)

	7	5	3	1	4	3	7	8	3	5
	+ 1	+ 5	+ 3	+ 8	+ 3	+ 4	+ 2	+ 2	+ 6	+ 4

(b)

	9	10	9	6	8	5	6	7	8	9
	- 1	- 1	- 2	- 3	- 4	- 4	- 2	- 5	- 3	- 6

(c) 6 + 1 = 4 + 4 = 3 + 2 = 2 + 4 = 5 + 2 =

5 - 1 = 6 - 3 = 7 - 3 = 7 - 2 = 9 - 8 =

(d)

Three plus one is equal to ____ 7 + ☐ = 8

Six minus three is equal to ____ ☐ + 3 = 6

One plus one plus one is equal to ____ 9 + ☐ = 10

Ten minus two is equal to ____ ☐ + 5 = 9

Five plus five is equal to ____ 4 + ☐ = 4

(e) 6 + 2 = ☐ + ☐ 5 + 1 + 1 = ☐

☐ + ☐ = 5 + 5

8 + 1 = ☐ + ☐ 3 + 3 - 1 = ☐

2. COUNTING

(a) 42 43 44 ____ ____ 5 ____ 15 20 ____

4 ____ 8 ____ 12 78 77 ____ ____ 74

(b)

1 2 3

☐ ☐ ☐

1 2 3

☐ ☐ ☐

(c)

75 is ☐ tens ☐ ones

69 is ☐ tens ☐ ones

☐ ____ is between 43 and 45.

☐ ____ is between 96 and 98.

☐ ____ is one greater than 55.

☐ ____ is one less than 69.

3. MONEY

(a)

5¢ 5¢ | 1¢ 1¢ 1¢ 1¢ 1¢ 1¢ 1¢ 1¢ 1¢ 1¢ | 10¢ 10¢ 10¢ | 10¢ 10¢ 5¢

5¢ 1¢ 1¢ | 10¢ 10¢ 10¢ 5¢

5¢ 5¢ 5¢ 5¢ 5¢ 5¢ | 10¢ 10¢ 5¢ 1¢ 1¢ 1¢ | 10¢ 10¢ 1¢ | 10¢ 5¢ 5¢ 5¢

10¢ 10¢ 5¢ 5¢ | 10¢ 1¢ 1¢

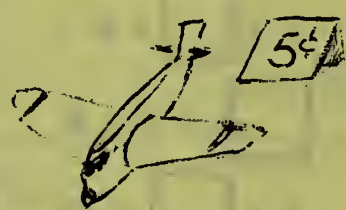
(b)

10¢

___ + ___ = 10¢

2¢ 3¢ 4¢ 5¢

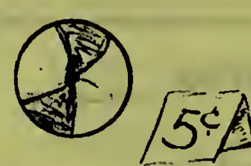
10¢



___ + ___ = 10¢

2¢ 3¢ 4¢ 5¢

15¢

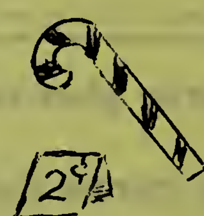


How many can you buy?

____

I can buy

8¢

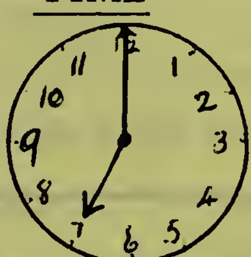


How many can you buy

____

I can buy

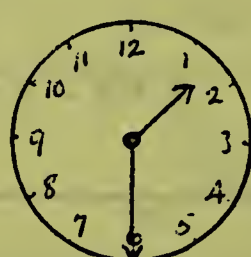
4. TIME



9 o'clock

7 o'clock

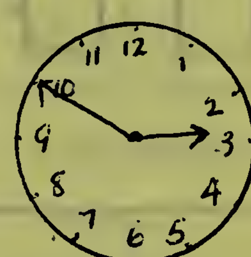
1 o'clock



half past one

one o'clock

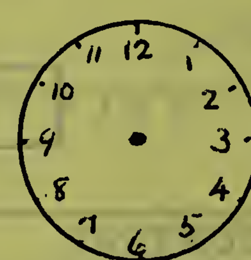
half past six



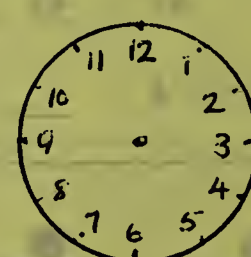
three o'clock

ten o'clock

ten minutes to three



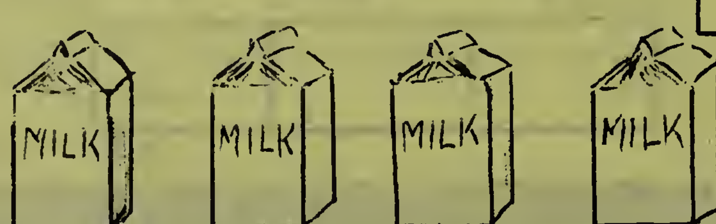
10 o'clock



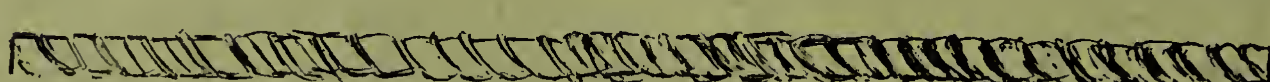
6 o'clock

5. MEASURES

(a)



(b)

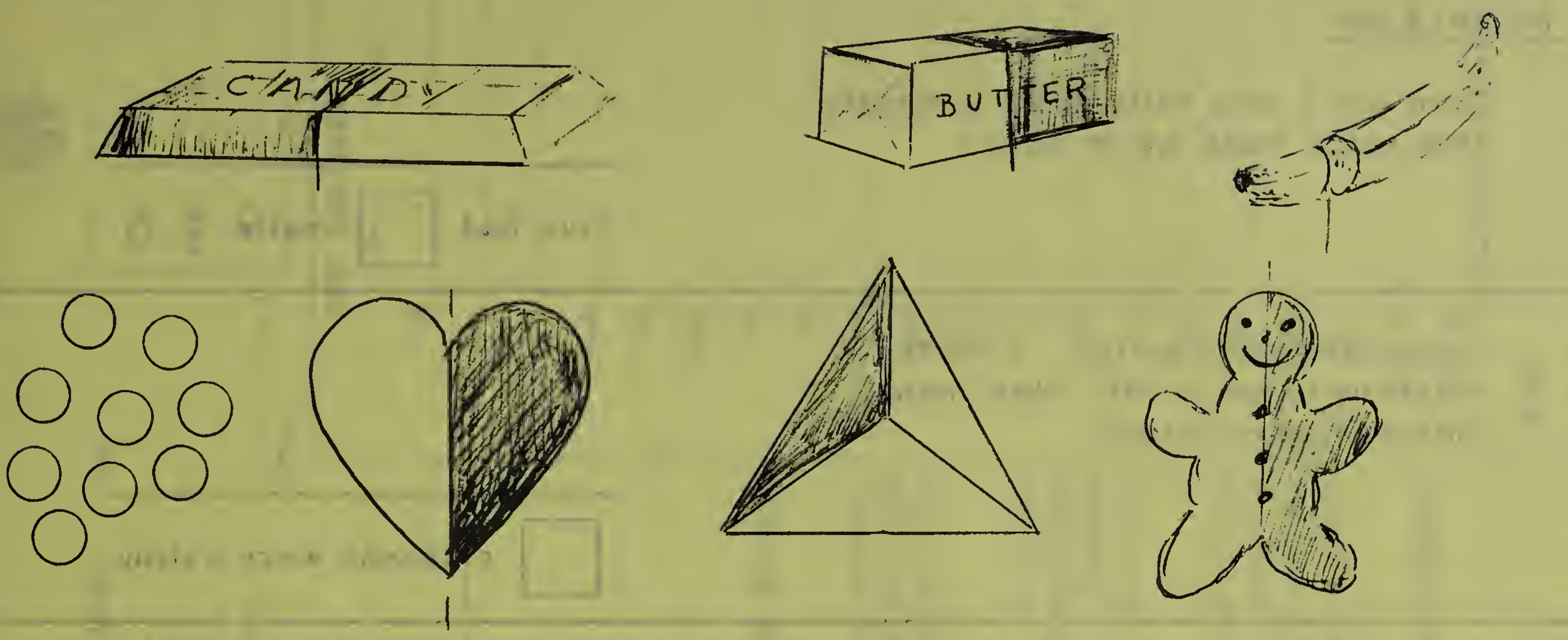


1 2 3 4 5 6 inches

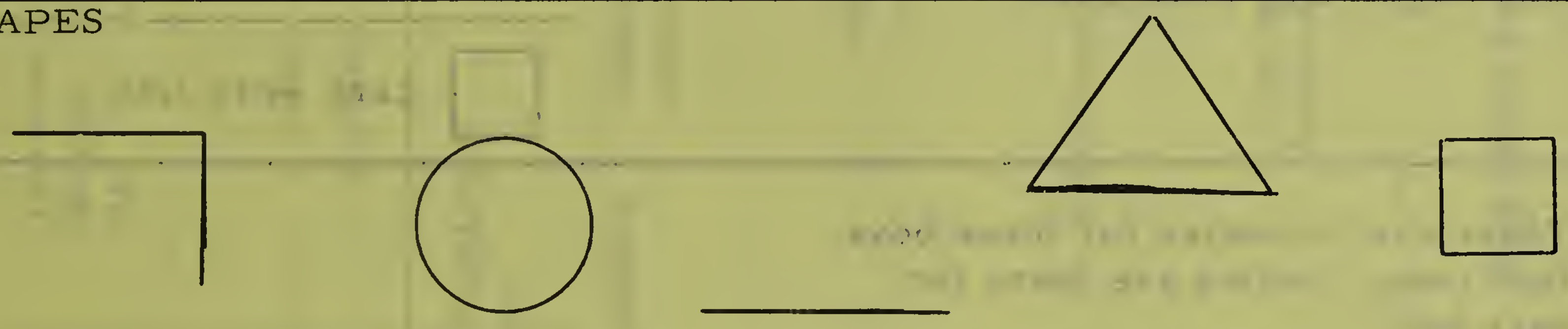
1 2 3 4

1 2 3 4 5 6 inches

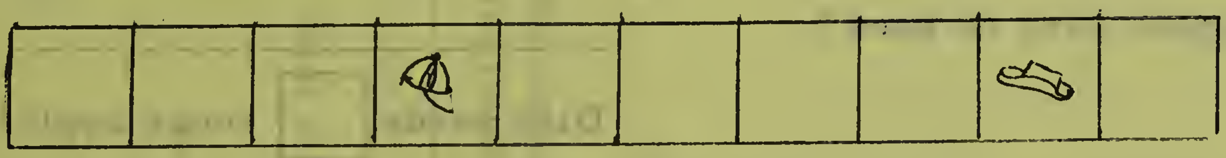
6. FRACTIONS

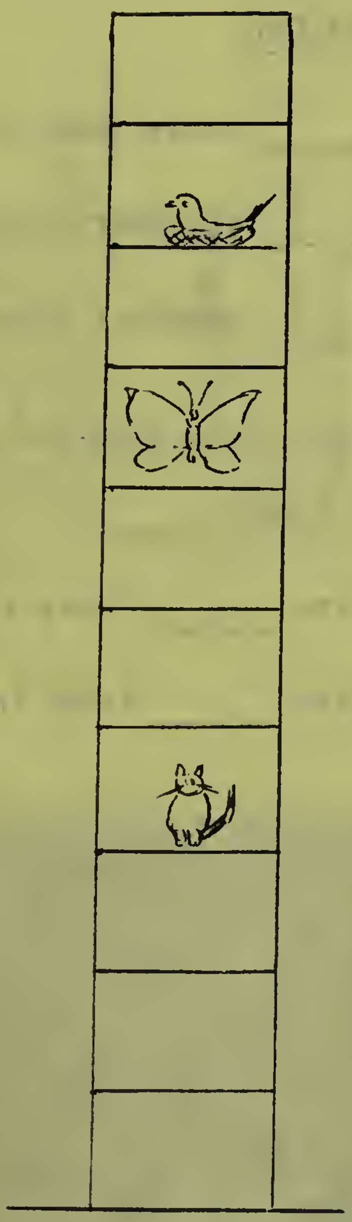


7. SHAPES



8. POSITIONAL MEANING





The  is in box ____ from the left.

The  is in box ____ from the right.

Draw  in the second box from the left.

Draw  in the fourth box from the right.

The  is in box ____ from the top.

The  is in box ____ from the top.

The  is in box ____ from the top.

Draw  in box 2 from the bottom.

Draw  in box 6 from the bottom.

Draw  in box 8 from the bottom.

9. PROBLEMS

1. Tom had 3 blue balls and 5 red balls. How many balls did he have ?

Tom had ☐ balls.

2. 5 chickens were eating. 2 more chickens came to eat. How many chickens were eating ?

☐ chickens were eating.

3. 10 cars were on the street. 6 cars went away. How many cars were left ?

☐ cars were left.

4. There are 9 cookies for three boys. How many cookies are there for each boy ?

There are ☐ cookies for each boy

5. Dick has 7 friends. He has 5 apples. How many more apples does he need ?

Dick needs ☐ more apples.

10. UNDERSTANDING

(a) 6 is ____ more than 4.

5 is ____ less than 7.

10 is ____ greater than 8.

3 is between ____ and ____.

9 is ____ greater than 8.

2 fours equal ____

8 = ☐ + ☐

There are ____ fives in 10.

6 = ☐ + ☐

There are ____ twos in 8.

1 inch meas

RECORD BOOKLET — *Form L-M*
Stanford-Binet Intelligence Scale

Name ______________ Sex ______

Address ______________

School ______ Grade ____ Examiner ______ [From ______]
Agency

Parent ______________

Birthplace ______ of father ______ of mother ______

Occupation of father ______ of mother ______

	Year	Month	Day
Date of test			
Birthdate			
Age			

CA ______
MA ______
IQ ______

FACTORS AFFECTING TEST PERFORMANCE
OVERALL RATING OF CONDITIONS

	Optimal	Good	Average	Detrimental	Seriously detrimental	
Attention						
a) Absorbed by task						Easily distracted
Reactions During Test Performance						
a) Normal activity level						Hyperactive or depressed
b) Initiates activity						Waits to be told
c) Quick to respond						Urging needed
Emotional Independence						
a) Socially confident						Shy, reserved, reticent
b) Realistically self-confident						Distrusts own ability or overconfident
c) Comfortable in adult company						Ill-at-ease
d) Assured						Anxious about success
Problem Solving Behavior						
a) Persistent						Gives up easily or can't give up
b) Reacts to failure realistically						Withdrawing, hostile, or denying
c) Eager to continue						Seeks to terminate
d) Challenged by hard tasks						Prefers only easy tasks
Independence of Examiner Support						
a) Needs minimum of commendation						Needs constant praise and encouragement

Was it hard to establish a positive relationship with this person? ______________

TEST SUMMARY

	Yrs.	Mos.
II		
II-6		
III		
III-6		
IV		
IV-6		
V		
VI		
VII		
VIII		
IX		
X		
XI		
XII		
XIII		
XIV		
AA		
SA I		
SA II		
SA III		
Total		

MA Score ______

Testing time ______

Houghton Mifflin Company, Boston

Examiner's Notes

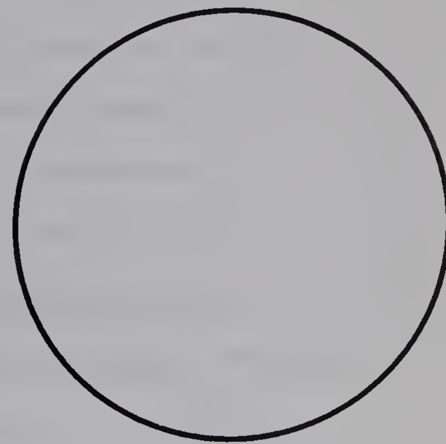
Test evidence of special strengths:

Test evidence of special weaknesses:

Reason for referral:

Suggestions:

NAME________________________________ AGE__________ DATE OF TEST________________



YEAR II (6 tests, 1 month each; or 4 tests, 1½ months each)

☐ 1. *Three-hole form board (1+) [ ] a)........ b)........

☐ 2. Delayed response (2+) [ ] a) Middle........ b) Right........ c) Left........

☐ 3. *Identifying parts of the body (same as II-6, 2) (4+) [ ]

a) Hair........ b) Mouth........ c) Feet........ d) Ear........ e) Nose........ f) Hands........ g) Eyes........

☐ 4. Block building: Tower (±) [ ]

☐ 5. *Picture vocabulary (same as II-6, 4; III, 2; IV, 1) (3+) [ ]

1. airplane........	4. ball........	7. horse........	10. ship........	13. flag........	16. pocket knife........
2. telephone........	5. tree........	8. knife........	11. umbrella........	14. cane........	17. pitcher........
3. hat........	6. key........	9. coat........	12. foot........	15. arm........	18. leaf........

☐ 6. *Word combinations (±) [ ] Example ____________________________

...... Alternate. Identifying objects by name (5+) [ ]

a) Dog........ b) Ball........ c) Engine........ d) Bed........ e) Doll........ f) Scissors........

_____ **Mos. credit at Year II**

YEAR II-6 (6 tests, 1 month each; or 4 tests, 1½ months each)

☐ 1. *Identifying objects by use (3+) [ ]

a) Cup........ b) Shoe........ c) Penny........ d) Knife........ e) Automobile........ f) Iron........

☐ 2. Identifying parts of the body (same as II, 3) (6+) [ ]

☐ 3. *Naming objects (5+) [ ]

a) Chair........ b) Automobile........ c) Box........ d) Key........ e) Fork........ f) Flag........

☐ 4. *Picture vocabulary (same as II, 5; III, 2; IV, 1) (8+) [ ]

☐ 5. *Repeating 2 digits (1+) [ ]

a) 4-7........ b) 6-3........ c) 5-8........

☐ 6. Obeying simple commands (2+) [ ] a)........ b)........ c)........

...... Alternate. Three-hole form board: Rotated (II, 1 must precede) (2+) [ ] a)........ b)........ c)........

_____ **Mos. Credit at Year II-6**

YEAR III (6 tests, 1 month each; or 4 tests, 1½ months each)

☐ 1. Stringing beads (4+) (2 min.) [ ]

☐ 2. *Picture vocabulary (same as II; II-6, 4; IV, 1) (10+) [ ]

☐ 3. *Block building: Bridge (±) [ ]

☐ 4. *Picture memories (1+) [ ] a)....... b).......

☐ 5. *Copying a circle (1+) [ ] a)....... b)....... c).......

☐ 6. Drawing a vertical line (±) [ ]

.... Alternate. Repeating 3 digits (1+) [ ]

a) 6-4-1....... b) 3-5-2....... c) 8-3-7.......

_____ Mos. Credit at Year III

YEAR III-6 (6 tests, 1 month each; or 4 tests, 1½ months each)

☐ 1. *Comparison of balls (3 of 3, or 5 of 6+) [ ]

a)....... b)....... c)......./ d)....... e)....... f).......

☐ 2. Patience: Pictures (1+) [ ]

a)....... b).......

☐ 3. *Discrimination of animal pictures (4+) [ ]

☐ 4. *Response to pictures (same as VI, A) (Level I, 2+) [ ]

a) Grandmother's story ....

....

....

....

b) Birthday party ....

....

....

....

c) Wash day ....

....

....

....

☐ 5. Sorting buttons (2 min. ±) [ ] Errors.......

☐ 6. *Comprehension I (1+) [ ]

a).. b)..

.... Alternate. Comparison of sticks (3 of 3, or 5 of 6+) [ ]

a)....... b)....... c)......./ d)....... e)....... f).......

_____ Mos. credit at Year III-6

YEAR IV (6 tests, 1 month each; or 4 tests, 1½ months each)

☐ 1. *Picture vocabulary (same as II, 5; II-6, 4; III, 2) (14+) [ ]

☐ 2. *Naming objects from memory (2+) [ ] a)........ b)........ c)........

☐ 3. *Opposite analogies I (same as IV-6, 2) (2+) [ ]

a)............... b)............... c)............... d)............... e)...............

☐ 4. *Pictorial identification (same as IV-6, A) (3+) [ ]

a) Stove........ b) Umbrella........ c) Cow........ d) Rabbit........ e) Moon........ f) Cat........

☐ 5. Discrimination of forms (8+) [ ]

☐ 6. Comprehension II (2+) [ ]

a).. b)..

...... Alternate. Memory for sentences I (1+) [ ]

a) We are going to buy some candy for mother.

b) Jack likes to feed the little puppies in the barn.

_____ **Mos. Credit at Year IV**

YEAR IV-6 (6 tests, 1 month each; or 4 tests, 1½ months each)

☐ 1. Aesthetic comparison (3+) [ ] a)........ b)........ c)........

☐ 2. *Opposite analogies I (same as IV, 3) (3+) [ ]

☐ 3. *Pictorial similarities and differences I (3+) [ ]

a)........ b)........ c)........ d)........ e)........

☐ 4. Materials (2+) [ ] a) House........ b) Window........ c) Book........

☐ 5. *Three commissions (3+) [ ] a)........ b)........ c)........

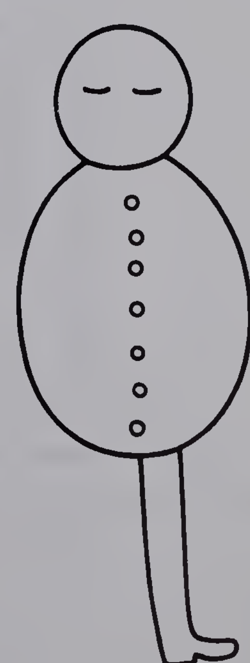
☐ 6. *Comprehension III (1+) [ ]

a).. b)..

...... Alternate. Pictorial identification (same as IV, 4) (4+) [ ]

_____ **Mos. credit at Year IV-6**

YEAR V (6 tests, 1 month each; or 4 tests, 1½ months each)



☐ 1. *Picture completion: Man (2 points+) [ ]

☐ 2. Paper folding: Triangle (±) [ ]

☐ 3. *Definitions (2+) [ ] a) Ball........ b) Hat........ c) Stove........

☐ 4. *Copying a square (1+) [ ] a)........ b)........ c)........

☐ 5. Pictorial similarities and differences II (9+) [ ]

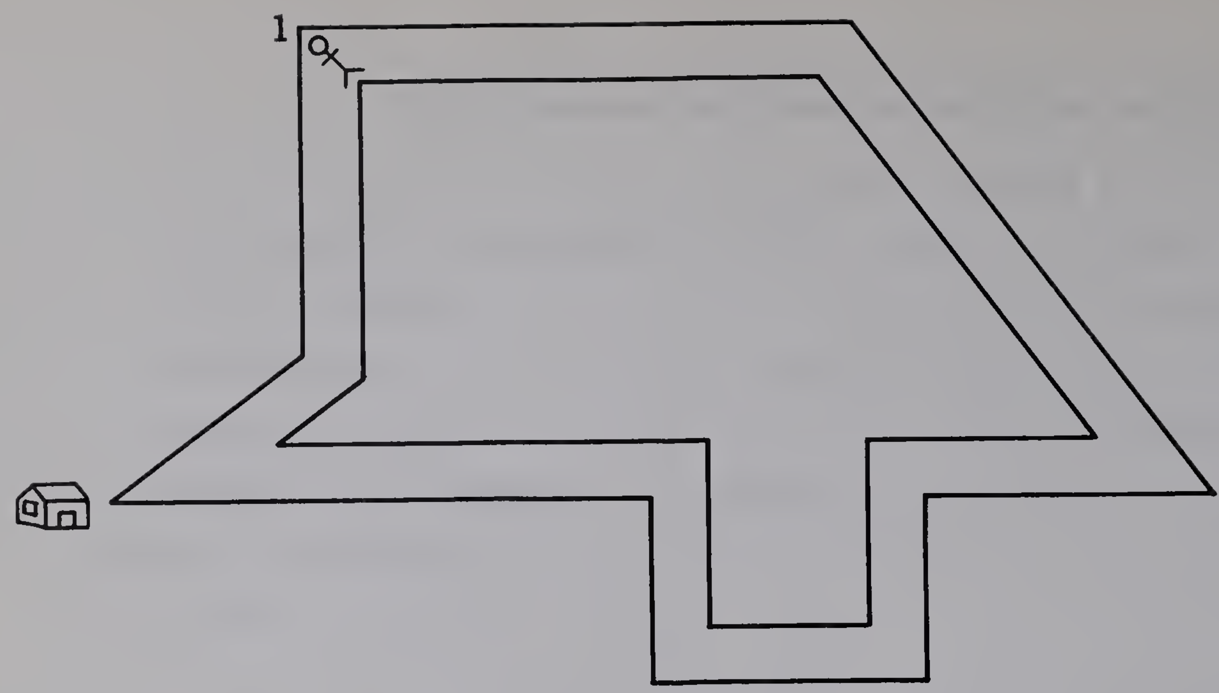
a)........ b)........ c)........ d)........ e)........

f)........ g)........ h)........ i)........ j)........

☐ 6. *Patience: Rectangles (2+) [ ] a)........ b)........ c)........

...... Alternate. Knot (±) [ ]

_____ **Mos. credit at Year V**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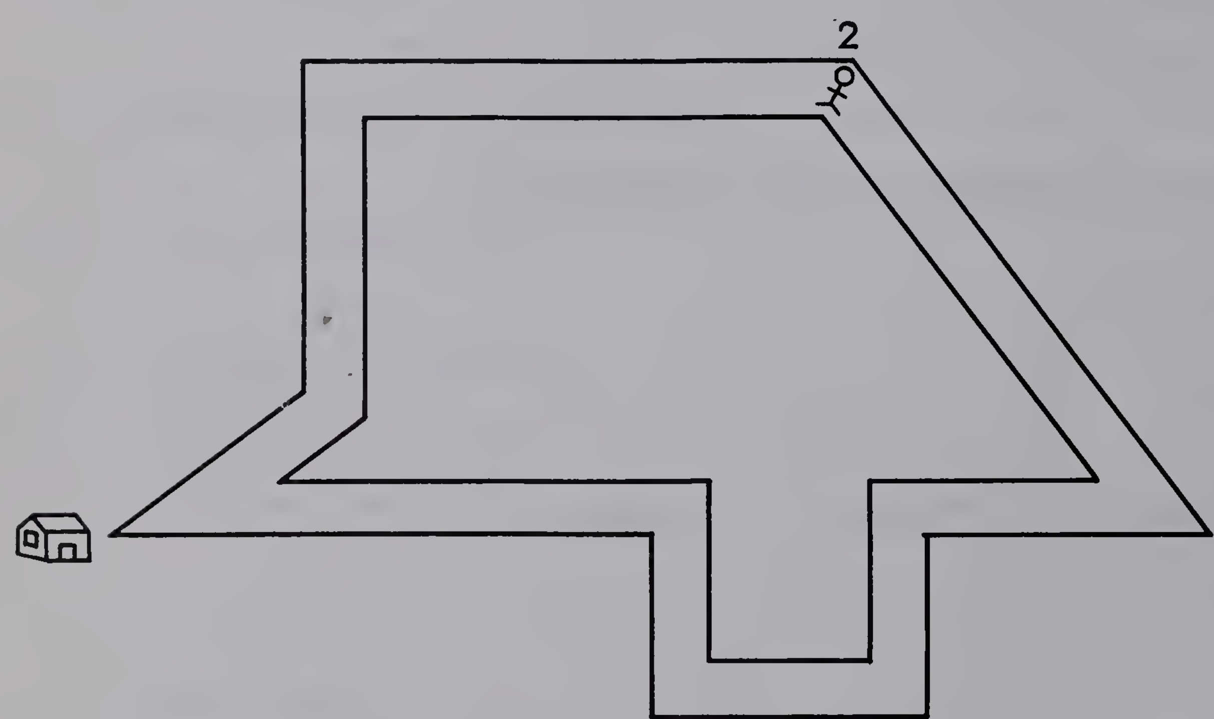
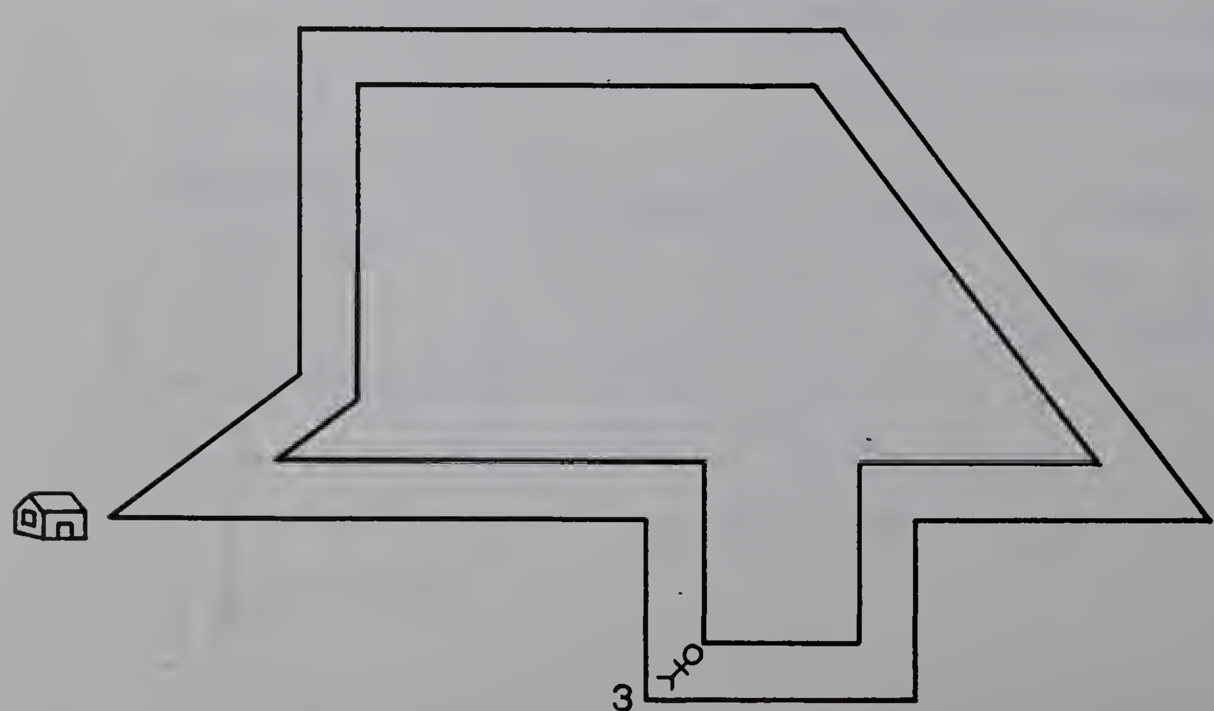

2


3

YEAR VI (6 tests, 2 months each; or 4 tests, 3 months each)

☐ 1. *Vocabulary (6+) [ ]

☐ 2. *Differences (2+) [ ]

a) Bird and dog...

b) Slipper and boot...

c) Wood and glass...

☐ 3. Mutilated pictures (4+) [ ]

a).............. b).............. c).............. d).............. e)..............

☐ 4. *Number concepts (4+) [ ] a)....... b)....... c)....... d)....... e).......

☐ 5. *Opposite analogies II (3+) [ ] a).............. b).............. c).............. d)..............

☐ 6. Maze tracing (2+) [ ] a)....... b)....... c).......

.... Alternate. Response to pictures (same as III-6, 4) (Level II, 2+) [ ]

____ **Mos. credit at Year VI**

YEAR VII (6 tests, 2 months each; or 4 tests, 3 months each)

☐ 1. Picture absurdities I (4+) [ ]

a)...

b)...

c)...

d)...

e)...

☐ 2. *Similarities: Two things (2+) [ ]

a) Wood and coal...

b) Apple and peach...

c) Ship and automobile...

d) Iron and silver...

☐ 3. *Copying a diamond (1+) [ ] a)....... b)....... c).......

☐ 4. *Comprehension IV (same as VIII, 5) (3+) [ ]

a)...

b)...

c)...

d)...

e)...

f)...

☐ 5. Opposite analogies III (2+) [ ]

a).............. b).............. c).............. d)..............

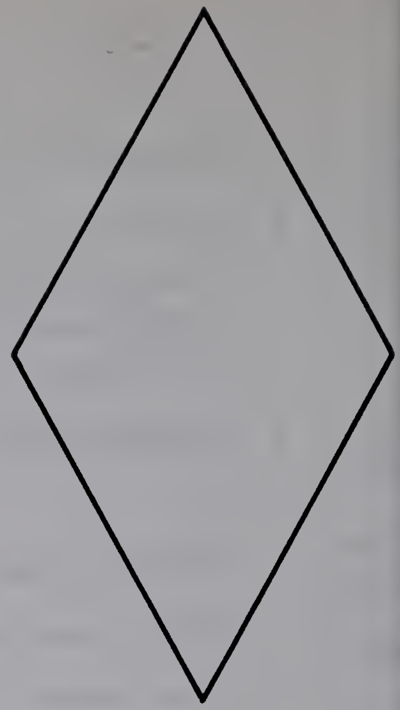
☐ 6. *Repeating 5 digits (1+) [ ]

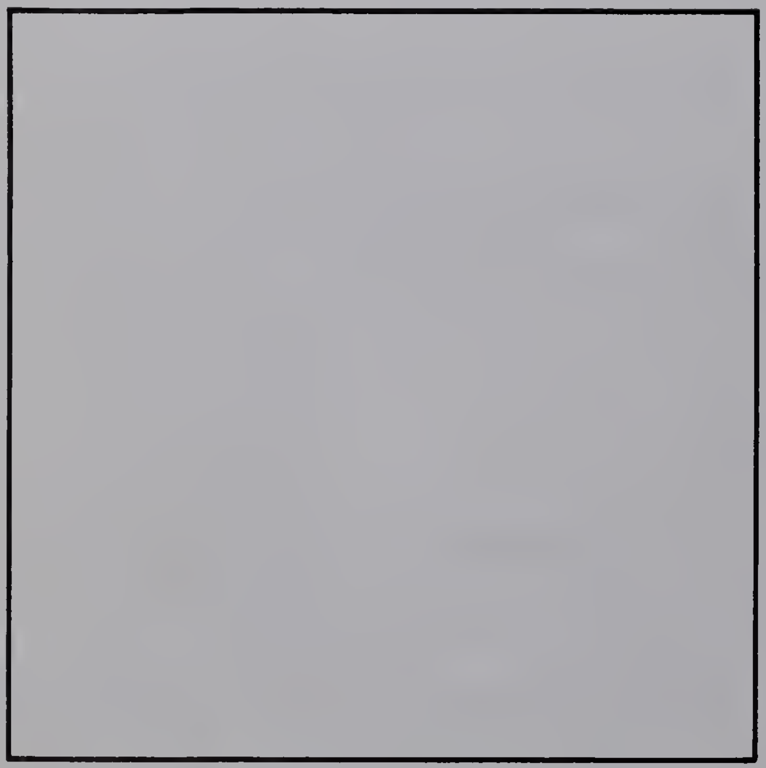
a) 3-1-8-5-9.............. b) 4-8-3-7-2.............. c) 9-6-1-8-3..............

.... Alternate. Repeating 3 digits reversed (1+) [ ]

a) 2-9-5....... b) 8-1-6....... c) 4-7-3.......

____ **Mos. credit at Year VII**





YEAR VIII (6 tests, 2 months each; or 4 tests, 3 months each)

☐ 1. *Vocabulary (8+) [ ]

☐ 2. Memory for stories: The Wet Fall (5+) [ ]
a)........................ b)........................ c)........................ d)........................
e).. f)..

☐ 3. *Verbal absurdities I (3+) [ ]
a)..
b)..
c)..
d)..

☐ 4. *Similarities and differences (3+) [ ]
a) Baseball — orange..
b) Airplane — kite..
c) Ocean — river..
d) Penny — quarter..

☐ 5. *Comprehension IV (same as VII, 4) (4+) [ ]

☐ 6. Naming the days of the week (order correct. 2 checks+) [ ] *Tu*........ *Thu*........ *Fri*........

.... Alternate. Problem situations I (2+) [ ]
a)..
b)..
c)..

____ Mos. credit at Year VIII

YEAR IX (6 tests, 2 months each; or 4 tests, 3 months each)

☐ 1. Paper cutting (same as XIII, A) (1+) [ ] a)........ b)........

☐ 2. Verbal absurdities II (same as XII, 2) (3+) [ ]
a)..
b)..
c)..
d)..
e)..

☐ 3. *Memory for designs I (same as XI, 1) (1+ or 2 with ½ credit each) [ ] a)........ b)........

☐ 4. *Rhymes: New form (3+) [ ] a)........ b)........ c)........ d)........

☐ 5. *Making change (2+) [ ] a) 10-4........ b) 15-12........ c) 25-4........

☐ 6. *Repeating 4 digits reversed (1+) [ ]
a) 8-5-2-6........................ b) 4-9-3-7........................ c) 3-6-2-9........................

.... Alternate. Rhymes: Old form (2+) (30 sec. ea.) [ ]
a)..
b)..
c)..

____ Mos. credit at Year IX

YEAR X (6 tests, 2 months each; or 4 tests, 3 months each)

☐ 1. *Vocabulary (11+) [ ]

☐ 2. Block counting (8+) [ ]

☐ 3. *Abstract words I (same as XII, 5) (2+) [ ]

a) Pity

b) Curiosity

c) Grief

d) Surprise

☐ 4. Finding reasons I (2+) [ ]

a)

b)

☐ 5. *Word naming (28 words in one minute+) [ ]

☐ 6. *Repeating 6 digits (1+) [ ]

a) 4-7-3-8-5-9 b) 5-2-9-7-4-6 c) 7-2-8-3-9-4

Alternate. Verbal absurdities III (2+) [ ]

a)

b)

c)

_____ Mos. credit at Year X

YEAR XI (6 tests, 2 months each; or 4 tests, 3 months each)

☐ 1. *Memory for designs I (same as IX, 3) (1½+) [ ]

☐ 2. *Verbal absurdities IV (2+) [ ]

a)

b)

c)

☐ 3. *Abstract words II (same as XIII, 2) (3+) [ ]

a) Connection

b) Compare

c) Conquer

d) Obedience

e) Revenge

☐ 4. Memory for sentences II (1+) [ ]

a) At the summer camp the children get up early in the morning to go swimming.

b) Yesterday we went for a ride in our car along the road that crosses the bridge.

☐ 5. Problem situation II (±) [ ]

☐ 6. *Similarities: Three things (3+) [ ]

a) Snake — cow — sparrow

b) Rose — potato — tree

c) Wool — cotton — leather

d) Knifeblade — penny — piece of wire

e) Book — teacher — newspaper

Alternate. Finding reasons II (2+) [ ]

a)

b)

_____ Mos. credit at Year XI

YEAR XII (6 tests, 2 months each; or 4 tests, 3 months each)

☐ 1. *Vocabulary (15+) [ ]

☐ 2. *Verbal absurdities II (same as IX, 2) (4+) [ ]

☐ 3. Picture absurdities II: The Shadow (±) [ ]

☐ 4. Repeating 5 digits reversed (1+) [ ]

a) 8-1-3-7-9 ________ b) 6-9-5-8-2 ________ c) 9-2-5-1-8 ________

☐ 5. *Abstract words I (same as X, 3) (3+) [ ]

☐ 6. *Minkus completion I (5 min.) (3+) [ ]

.... Alternate. Memory for designs II (±) [ ]

_____ **Mos. credit at Year XII**

YEAR XIII (6 tests, 2 months each; or 4 tests, 3 months each)

☐ 1. *Plan of search (±) [ ]

☐ 2. *Abstract words II (same as XI, 3) (4+) [ ]

☐ 3. Memory for sentences III (1+) [ ]

a) The airplane made a careful landing in the space which had been prepared for it.

b) Tom Brown's dog ran quickly down the road with a huge bone in his mouth.

☐ 4. *Problems of fact (2+) [ ]

a) ________

b) ________

c) ________

☐ 5. *Dissected sentences (2+) (1 min. ea.) [ ]

a) ________

b) ________

c) ________

☐ 6. Copying a bead chain from memory (±) (2 min.) [ ]

.... Alternate. Paper cutting (same as IX, 1) (2+) [ ]

_____ **Mos. credit at Year XIII**

YEAR XIV (6 tests, 2 months each; or 4 tests, 3 months each)

☐ 1. *Vocabulary (17+) [ ]

☐ 2. *Induction (±) [ ] a) ____ b) ____ c) ____ d) ____ e) ____ f) ____ Rule: ________

☐ 3. *Reasoning I (±) [ ]

☐ 4. *Ingenuity I (same as AA, 2; SA II, 4) (1+) (3 min. ea.) [ ]

a) ________

b) ________

c) ________

☐ 5. Orientation: Direction I (3+) [ ] a) ____ b) ____ c) ____ d) ____ e) ____

☐ 6. Reconciliation of opposites (same as SA I, A) (2+) [ ]

a) Winter — summer ________ d) Much — little ________

b) Happy — sad ________ e) Beginning — end ________

c) Loud — soft ________

.... Alternate. Ingenuity II (1+) (3 min. ea.) [ ]

a) ________

b) ________

c) ________

_____ **Mos. credit at Year XIV**

MINKUS COMPLETION I

a) We like to pop corn .... to roast chestnuts over the fire.

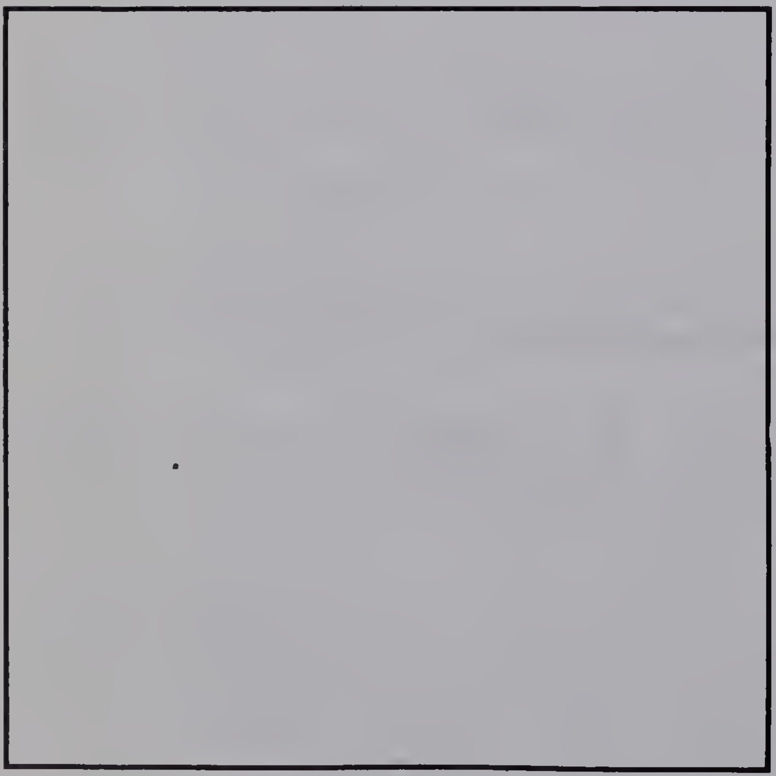
b) One cannot always be a hero, ... one can always be a man.

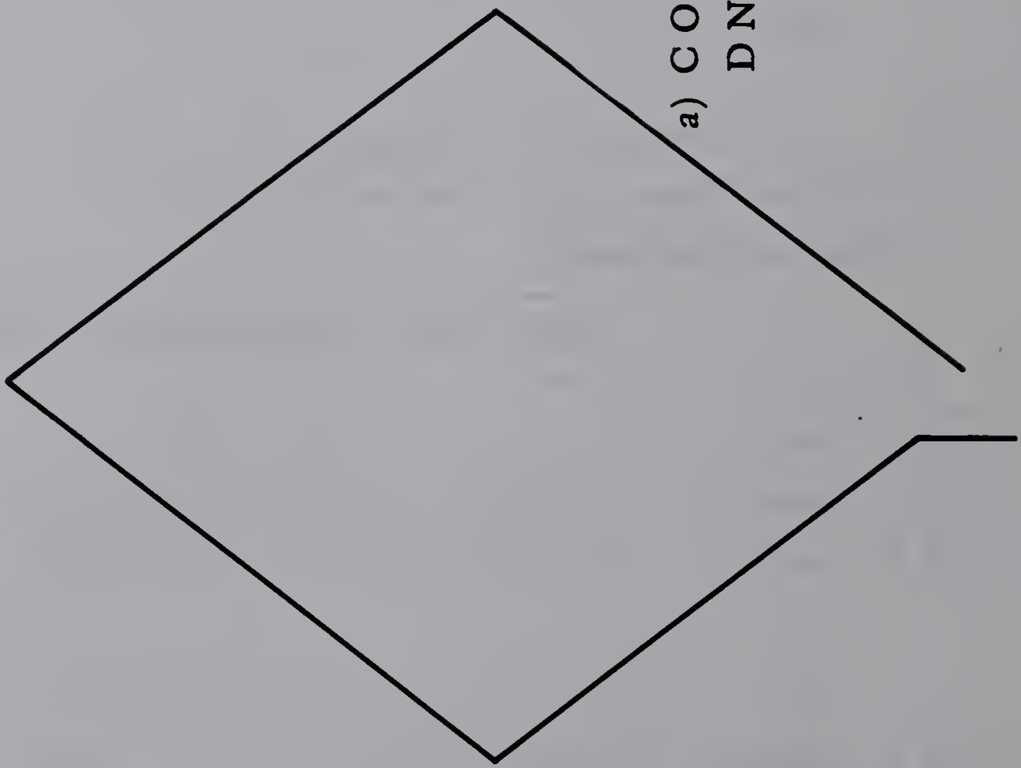
c) The streams are dry .... there has been little rain.

d) Lincoln aroused no jealousy .... he was not selfish.

b) COME TO LONDON
APKF RP JPLEMO
HURRY

a) COME TO LONDON
DNND UN MNOCPM
HURRY





MINKUS COMPLETION II

a) He is..............................well grounded in geography..................................his brother,................................... he is not so quick in arithmetic.

b) .... he give me his word, I will not trust him.

c) You must not, ..., imagine that my silence has been due to ignorance of what is going on.

d) .... either of us could speak, we were at the bottom of the stairs.

AVERAGE ADULT (8 tests, 2 months each; or 4 tests, 4 months each)

☐ 1. *Vocabulary (20+) [ ]

☐ 2. *Ingenuity I (same as XIV, 4; SA II, 4) (2+) (3 min. ea.) [ ]

☐ 3. *Differences between abstract words (2+) [ ]
- a) Laziness and idleness..........
- b) Poverty and misery..........
- c) Character and reputation..........

☐ 4. Arithmetical reasoning (2+) (1 min. ea.) [ ] a)....... b)....... c).......

☐ 5. Proverbs I (2+) [ ]
- a)..........
- b)..........
- c)..........

☐ 6. Orientation: Direction II (4+) [ ]
a)....... b)....... c)....... d)....... e).......

☐ 7. *Essential differences (same as SA II, 5) (2+) [ ]
- a) Work and play..........
- b) Ability and achievement..........
- c) An optimist and a pessimist..........

☐ 8. Abstract words III (4+) [ ]
- a) Generosity..........
- b) Independent..........
- c) Envy..........
- d) Authority..........
- e) Justice..........

.... Alternate. Binet paper cutting (±) [ ]

_____ **Mos. credit at Average Adult Level**

SUPERIOR ADULT I (6 tests, 4 months each; or 4 tests, 6 months each)

☐ 1. *Vocabulary (23+) [ ]

☐ 2. Enclosed box problem (4+) [ ] a)....... b)....... c)....... d).......

☐ 3. *Minkus completion II (2+) (5 min.) [ ]

☐ 4. *Repeating 6 digits reversed (1+) [ ]
a) 4-7-1-9-5-2.......... b) 5-8-3-6-9-4.......... c) 7-5-2-6-1-8..........

☐ 5. *Sentence building (2+) [ ]
- a) Ceremonial — dignity — impression..........
- b) Baffle — cunning — pursuit..........
- c) Failure — business — incompetent..........

☐ 6. Essential similarities (3+) [ ]
- a) Farming and manufacturing..........
- b) Melting and burning..........
- c) An egg and a seed..........

.... Alternate. Reconciliation of opposites (same as XIV, 6) (4+) [ ]

_____ **Mos. credit at Superior Adult Level I**

SUPERIOR ADULT II (6 tests, 5 months each; or 4 tests, 7½ months each)

☐ 1. *Vocabulary (26+) [ ]

☐ 2. Finding reasons III (2+) [ ]
a)..
b)..

☐ 3. *Proverbs II (1+) [ ]
a)..
b)..

☐ 4. *Ingenuity I (same as XIV, 4; AA, 2) (3+) (3 min. ea.) [ ]

☐ 5. *Essential differences (same as AA, 7) (3+) [ ]

☐ 6. Repeating thought of passage I: Value of Life (4 or 5 of 7, +) [ ]

Many opinions have been given on the value of life. | Some call it good, | others call it bad. | It would be nearer correct to say that it is mediocre, | for on the one hand our happiness is never as great as we should like, | and on the other hand our misfortunes are never as great as our enemies would wish for us. | It is this mediocrity of life which prevents it from being radically unjust.

.... Alternate. Codes (1+ or 2 with ½ credit each) (3 min. ea.) [ ] a)....... b).......

_____ **Mos. credit at Superior Adult Level II**

SUPERIOR ADULT III (6 tests, 6 months each; or 4 tests, 9 months each)

☐ 1. *Vocabulary (30+) [ ]

☐ 2. Proverbs III (2+) [ ]
a)..
b)..
c)..

☐ 3. *Opposite analogies IV (2+) [ ] a)..................... b)..................... c).....................

☐ 4. Orientation: Direction III (2+) [ ] a)....... b).......

☐ 5. *Reasoning II (5 min.) (±) [ ]

☐ 6. *Repeating thought of passage II: Tests (4 of 8, +) [ ]

Tests such as we are now making are of value both for the advancement of science and | for the information of the person who is tested. | It is important for science to learn how people differ and | on what factors these differences depend. | If we can separate the influence of heredity from the influence of environment, | we may be able to apply our knowledge so as to guide human development. | We may thus in some cases correct defects and | develop abilities which we might otherwise neglect.

.... Alternate. Opposite analogies V (2+) [ ]
a)........................ b)........................ c)........................

_____ **Mos. credit at Superior Adult Level III**

VOCABULARY

Score..........................

.... 1. orange..........
.... 2. envelope..........
.... 3. straw..........
.... 4. puddle..........
.... 5. tap..........
.... 6. gown..........
.... 7. roar..........
.... 8. eyelash..........
.... 9. Mars..........
........10. juggler..........
........11. scorch..........
........12. lecture..........
........13. skill..........
........14. brunette..........
........15. muzzle..........
........16. haste..........
........17. peculiarity..........
........18. priceless..........
........19. regard..........
........20. tolerate..........
........21. disproportionate..........
........22. lotus..........
........23. shrewd..........
........24. mosaic..........
........25. stave..........
........26. bewail..........
........27. ochre..........
........28. repose..........
........29. ambergris..........
........30. limpet..........
........31. frustrate..........
........32. flaunt..........
........33. incrustation..........
........34. retroactive..........
........35. philanthropy..........
........36. piscatorial..........
........37. milksop..........
........38. harpy..........
........39. depredation..........
........40. perfunctory..........
........41. achromatic..........
........42. casuistry..........
........43. homunculus..........
........44. sudorific..........
........45. parterre..........

Age Level	Score
VI	6
VIII	8
X	11
XII	15
XIV	17
AA	20
SA I	23
SA II	26
SA III	30

PEABODY PICTURE VOCABULARY TEST

Individual Test Record

Form B

Name ______________________________ Sex: M F (circle) Grade ________
(Last) (First) (Initial)

School ______________________________ (or address) Teacher ______________________________ (or parent or phone)

Calculation	
Ceiling item	________
Errors	________
Raw score	________

DERIVED SCORES

Mental Age (M. A.) ________
Intelligence quotient (I. Q.) ________
Percentile (%ile) ________

	Year	Month	Day
Date	____	____	____
Born	____	____	____
Age	____	____	

Examiner ______________________ Time ____________ Code ____________

* * * J-1 * * * F-2 * * * M-3 * * * A-4 * * * M-5 * * * J-6 * * * J-7 * * * A-8 * * * S-9 * * * O-10 * * * N-11 * * * D-12 * * *

TEST BEHAVIOR

Examples needed:	____only 1	____2 or 3	____over 3
Type of response:	____Subject pointed	____S. called numbers	____Examiner pointed
Rapport:	____easily attained	____slowly attained	____poor rapport
Guessing:	____prone to guess	____guessed when asked	____resisted guessing
Speed of response:	____fast	____average	____slow
Verbalization:	____talkative	____average	____taciturn
Attention span:	____distractible	____average	____very attentive
Perseveration:	____none noted	____some	____frequent
Need for praise:	____little needed	____some needed	____much needed

Other test behavior:

PHYSICAL CHARACTERISTICS

Motor activity:	____hyperactive	____average	____hypoactive
Sedation:	____none	____slight	____heavy
Ambulation:	____normal	____walks with support	____none
Speech:	____intelligible	____fairly intelligible	____unintelligible
Hearing: necessity to repeat stimulus words	____never	____seldom	____often
	____S. wore hearing aid	____S. watched examiner's lips and face closely.	
Vision: distance of eyes from page	____under 8″	____average (8″-20″)	____over 20″
	____S. wore glasses	____S. owned but did not wear glasses during test.	

Other physical characteristics:

OTHER INFORMATION

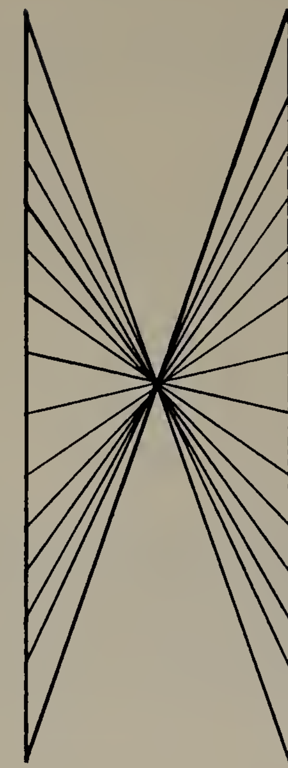
(previous tests, dates, scores etc.; teacher estimates of vocabulary, intelligence, achievement; school or work record)

AMERICAN GUIDANCE SERVICE, INC.
Minneapolis — Nashville — Philadelphia
Litho in U.S.A.

Name

Form B

Item	Resp.	Key	Word
1		(2)	table
2		(4)	bus
3		(2)	horse
4		(3)	dog
5		(4)	shoe
6		(4)	finger
7		(3)	boat
8		(2)	children
9		(1)	bell
10		(4)	turtle
11		(2)	climbing
12		(1)	lamp
13		(3)	sitting
14		(2)	jacket
15		(1)	pulling
16		(2)	ring
17		(1)	nail
18		(2)	hitting
19		(3)	tire
20		(3)	ladder
21		(1)	snake
22		(1)	river
23		(4)	ringing
24		(4)	baking
25		(2)	cone
26		(3)	engineer
27		(4)	peeking
28		(1)	kite
29		(1)	rat
30		(1)	time
31		(4)	sail
32		(2)	ambulance
33		(2)	trunk
34		(4)	skiing
35		(2)	hook
36		(1)	tweezers
37		(3)	wasp
38		(2)	barber
39		(3)	parachute
40		(4)	saddle
41		(3)	temperature
42		(1)	captain
43		(2)	whale
44		(4)	cash
45		(1)	balancing
46		(3)	cobweb
47		(3)	pledging
48		(1)	argument
49		(3)	hydrant
50		(4)	binocular
51		(1)	locomotive
52		(2)	hive
53		(4)	reel
54		(1)	insect
55		(1)	gnawing
56		(2)	weapon
57		(3)	bannister
58		(1)	idol
59		(1)	globe
60		(3)	walrus
61		(1)	filing
62		(3)	shears
63		(1)	horror
64		(4)	chef
65		(4)	harvesting
66		(3)	construction
67		(4)	observatory
68		(4)	assistance
69		(2)	erecting
70		(3)	thoroughbred
71		(2)	casserole
72		(4)	ornament
73		(3)	cobbler
74		(2)	autumn
75		(3)	dissatisfaction
76		(4)	scholar
77		(1)	oasis
78		(3)	soldering
79		(3)	astonishment
80		(1)	tread
81		(2)	thatched
82		(1)	jurisprudence
83		(2)	sapling
84		(3)	arch
85		(4)	dwelling
86		(1)	lubricating
87		(2)	pedestrian
88		(3)	vale
89		(3)	jubilant
90		(2)	laden
91		(2)	pursuit
92		(4)	goblet
93		(2)	rodent
94		(3)	confiding
95		(4)	reclining
96		(1)	frisking
97		(2)	moat
98		(3)	salutation
99		(2)	barrier
100		(3)	foal
101		(4)	incandescent
102		(3)	cornucopia
103		(2)	ascending
104		(1)	summit
105		(3)	caster
106		(2)	lobe
107		(3)	patriarch
108		(3)	sampler
109		(3)	ingenious
110		(1)	repose
111		(3)	constrain
112		(1)	tangent
113		(4)	sconce
114		(4)	hoary
115		(1)	pendant
116		(1)	prodigy
117		(2)	casement
118		(1)	quiescent
119		(4)	talon
120		(1)	chevron
121		(4)	feline
122		(2)	cairn
123		(4)	convergence
124		(3)	apothecary
125		(2)	indigent
126		(4)	edifice
127		(3)	scallion
128		(1)	infirm
129		(1)	emaciate
130		(2)	catapult
131		(2)	arable
132		(4)	orifice
133		(3)	renovate
134		(1)	precarious
135		(2)	dromedary
136		(1)	pedagogue
137		(1)	sepal
138		(3)	lethargic
139		(4)	delectation
140		(3)	embellish
141		(1)	osculation
142		(2)	cincture
143		(3)	barrister
144		(3)	carrion
145		(2)	lanate
146		(4)	chirography
147		(1)	mendicant
148		(1)	saltation
149		(2)	florescence
150		(4)	culver



Marianne Frostig

DEVELOPMENTAL TEST OF VISUAL PERCEPTION

In collaboration with: Welty Lefever, Ph.D. and John R. B. Whittlesey, M.S.

T H I R D   E D I T I O N

Name .... Sex.... M.... F...

Age........ Grade....... School...

Date.......................... Examiner..

CONSULTING PSYCHOLOGISTS PRESS 577 COLLEGE AVENUE, PALO ALTO, CALIFORNIA

MARIANNE FROSTIG

DEVELOPMENTAL TEST OF VISUAL PERCEPTION

THIRD EDITION

I. EYE-MOTOR COORDINATION

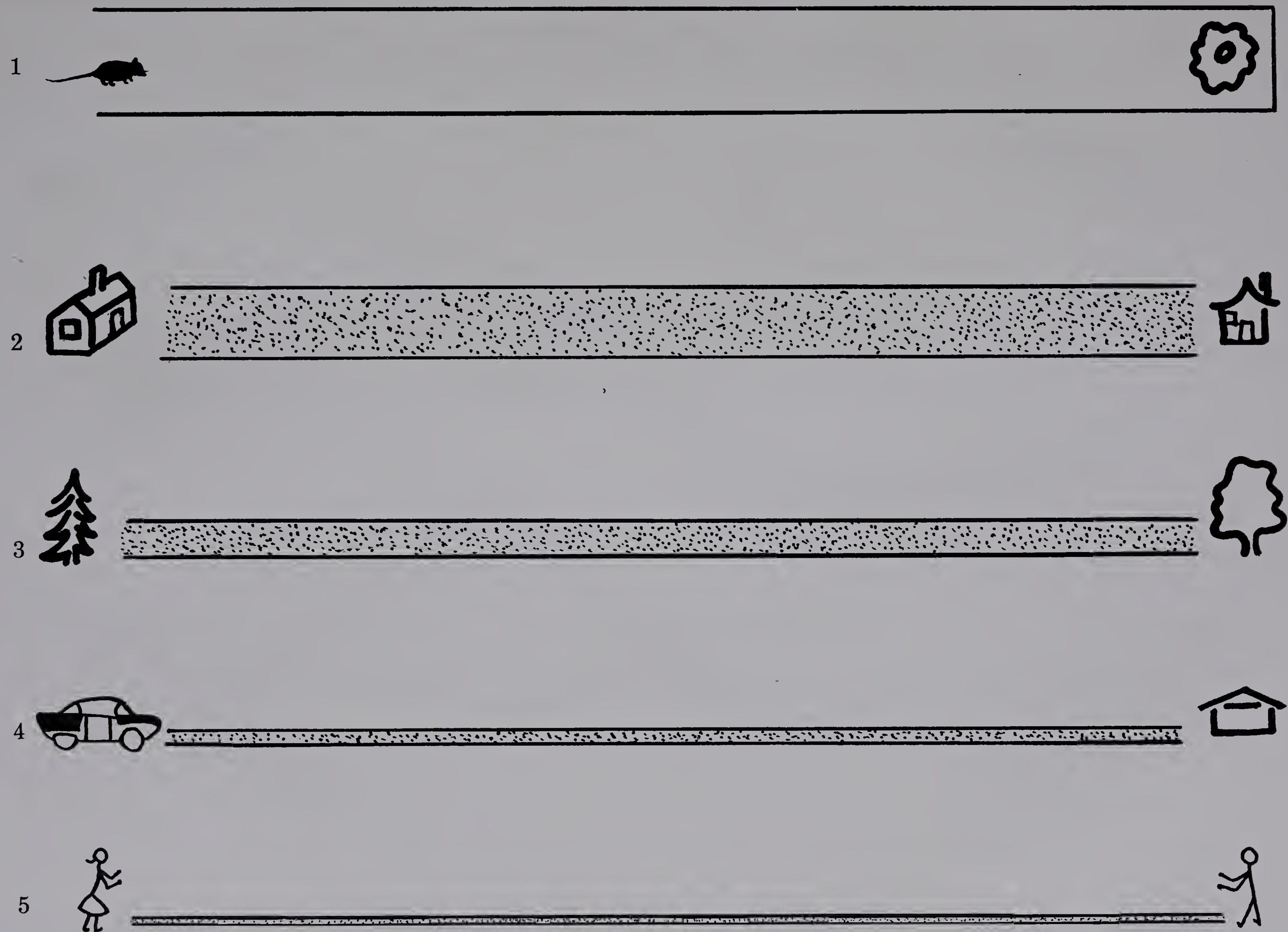
II. FIGURE GROUND

III. FORM CONSTANCY

IV. POSITION IN SPACE

V. SPATIAL RELATIONS

1a



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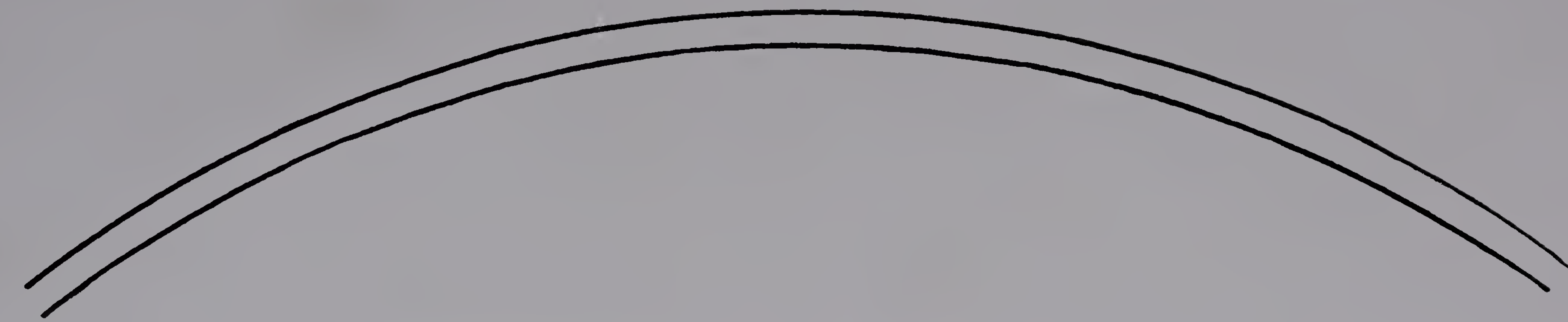

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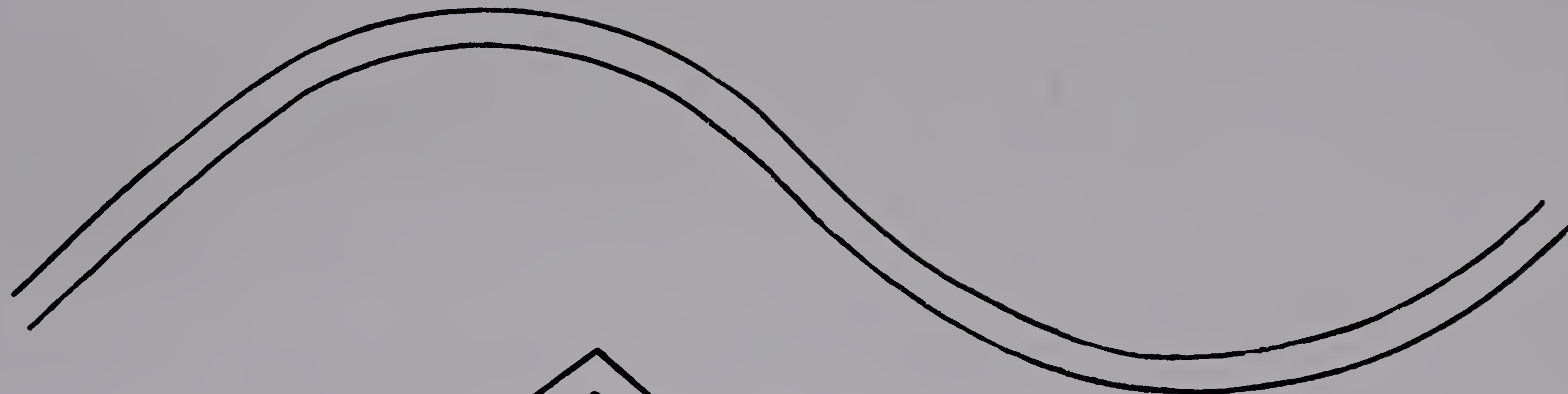

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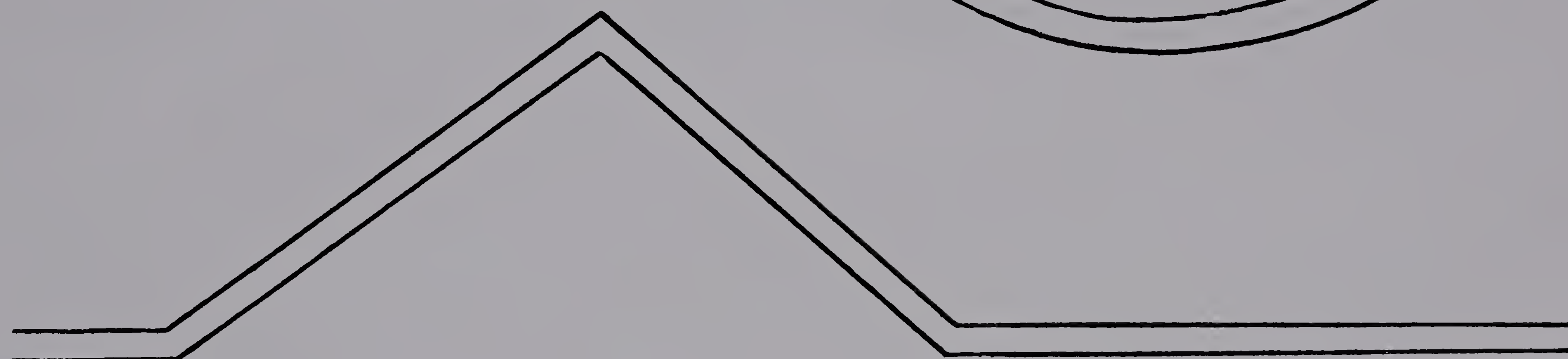

9

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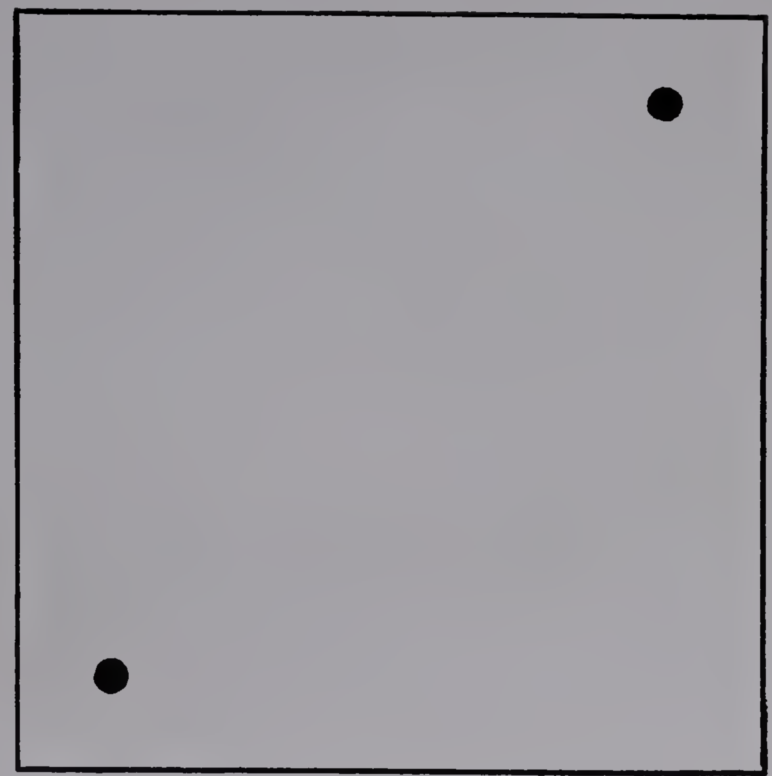

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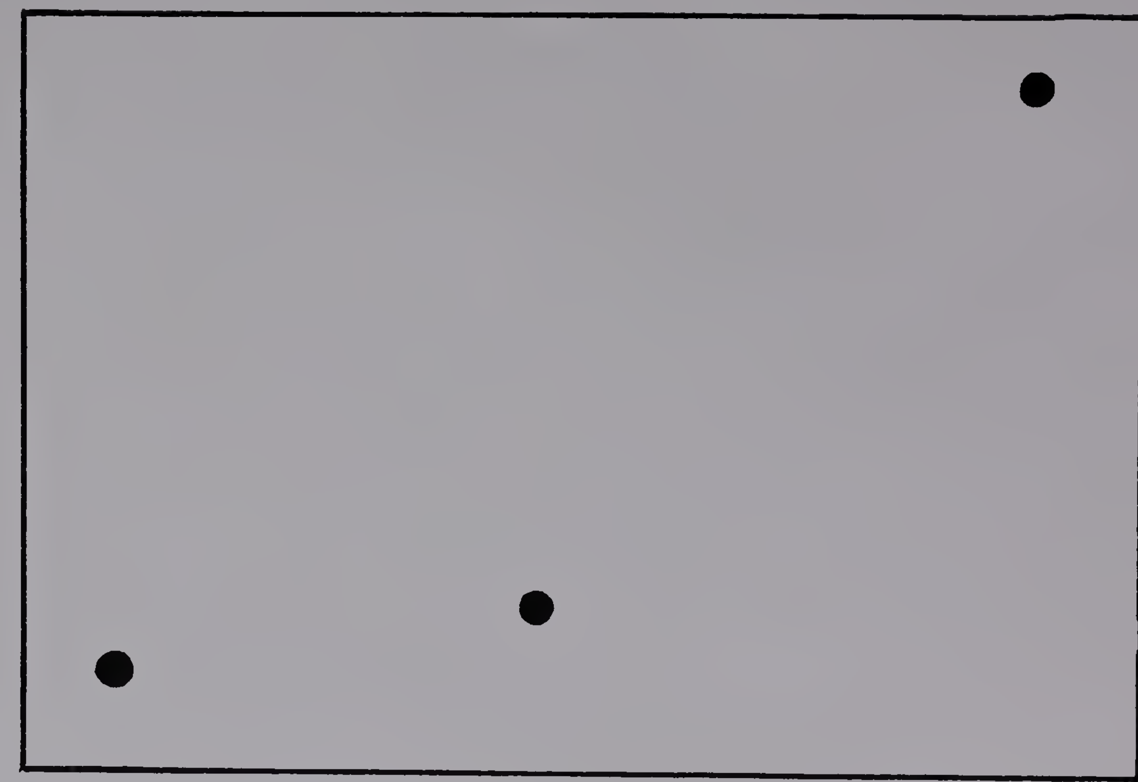

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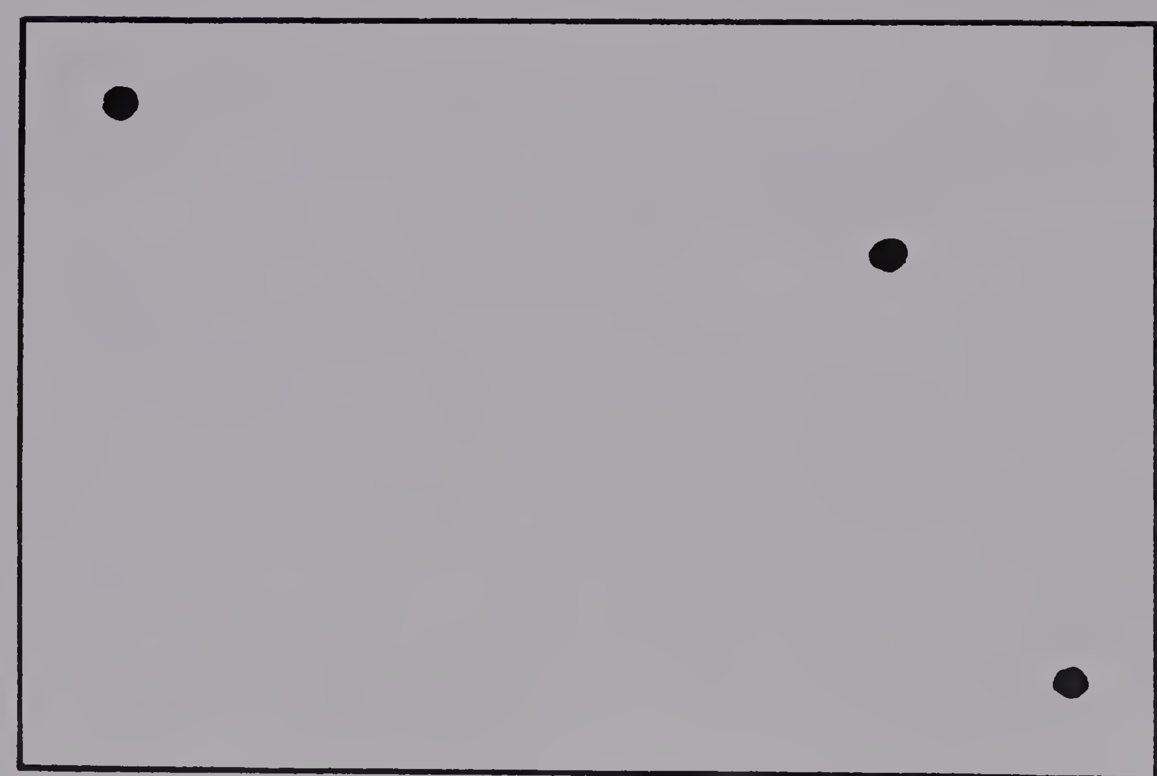
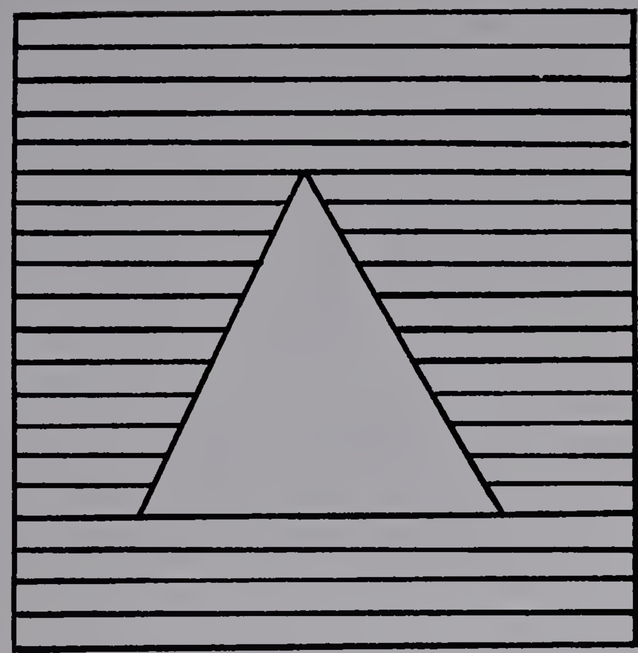


IIa

1



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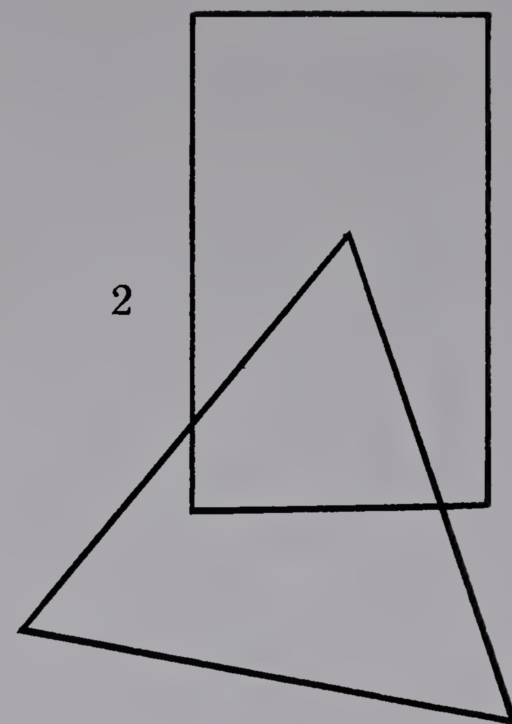

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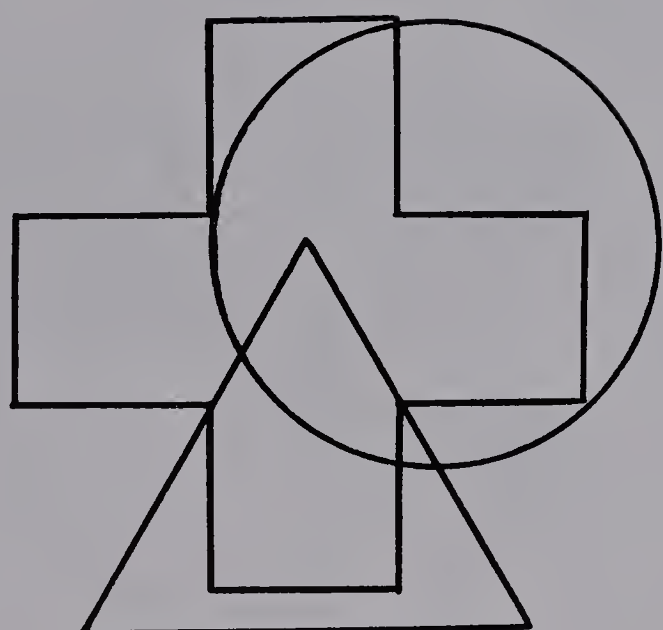

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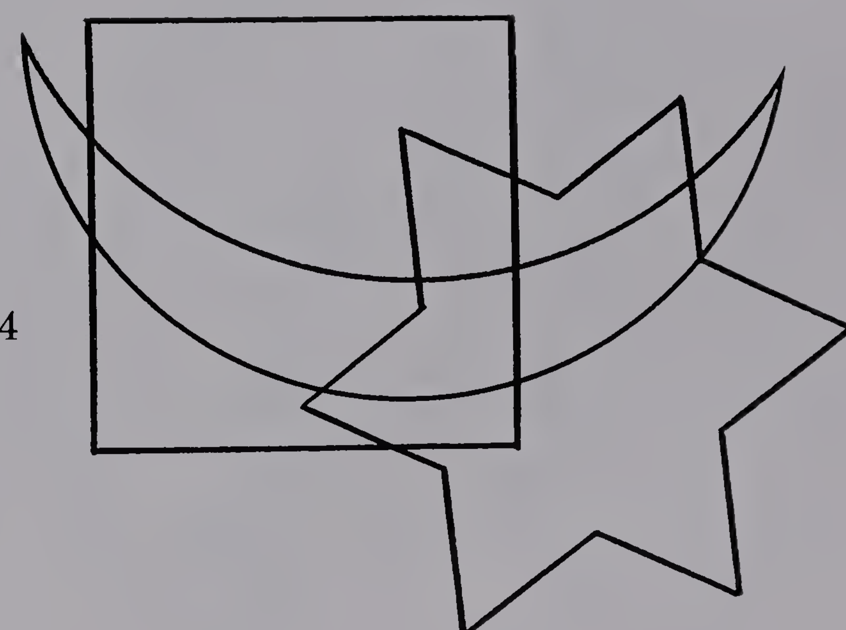

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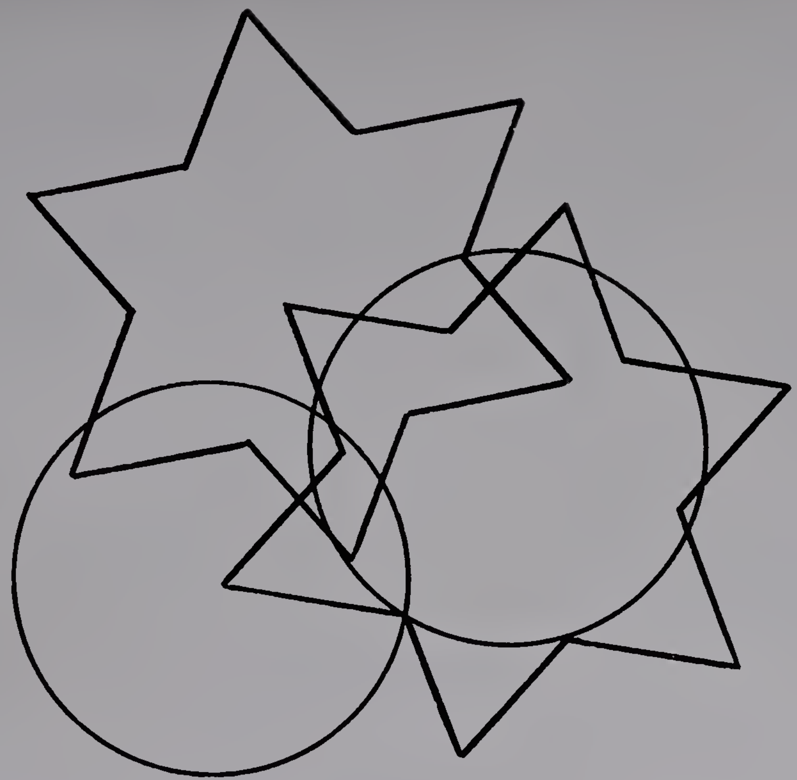

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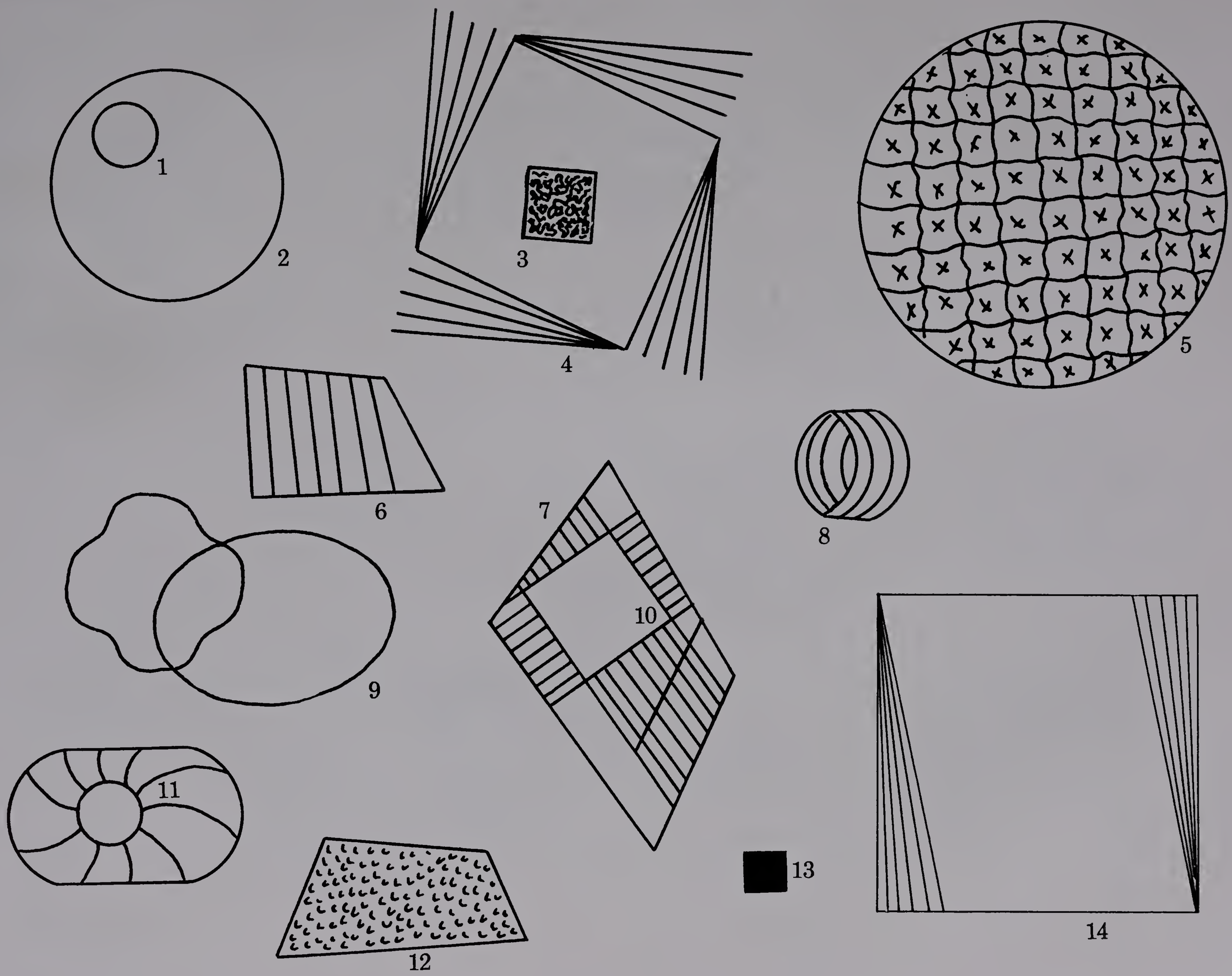
1
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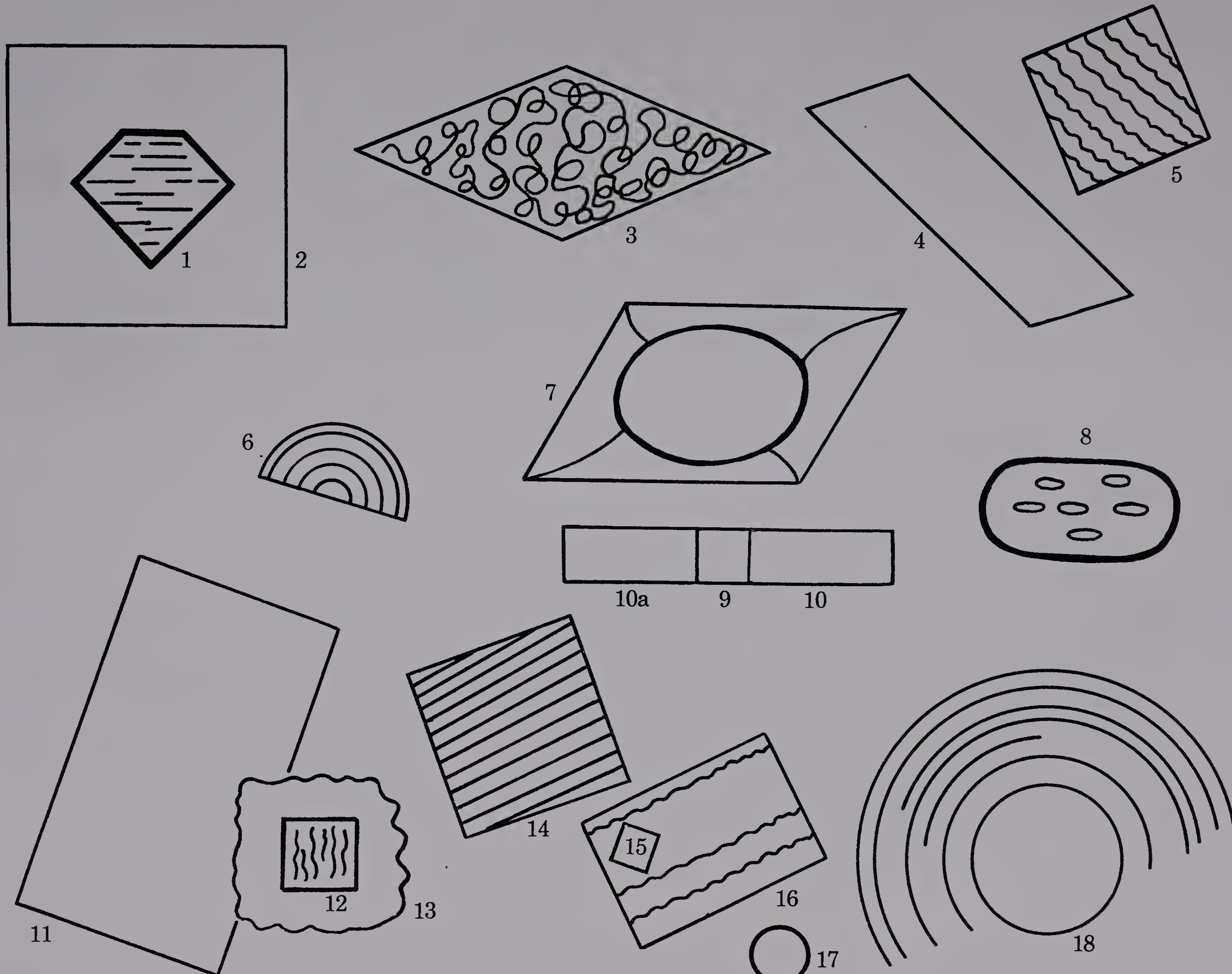
IIIb



IVa

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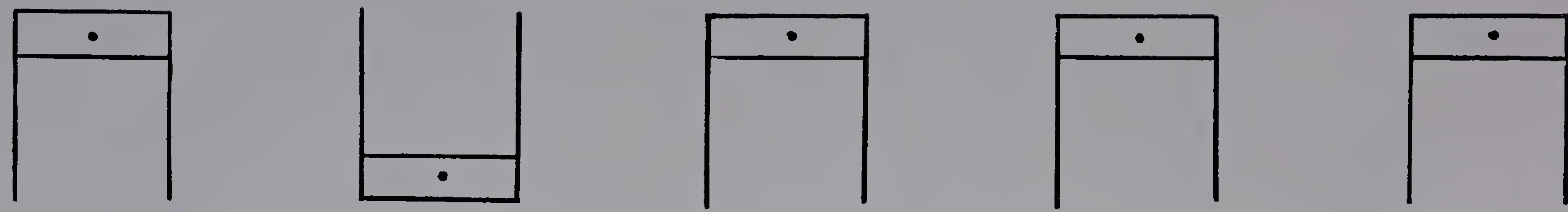

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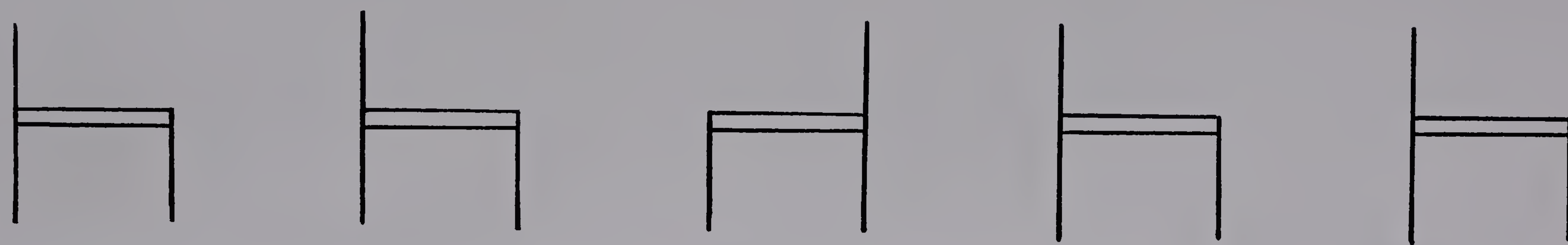

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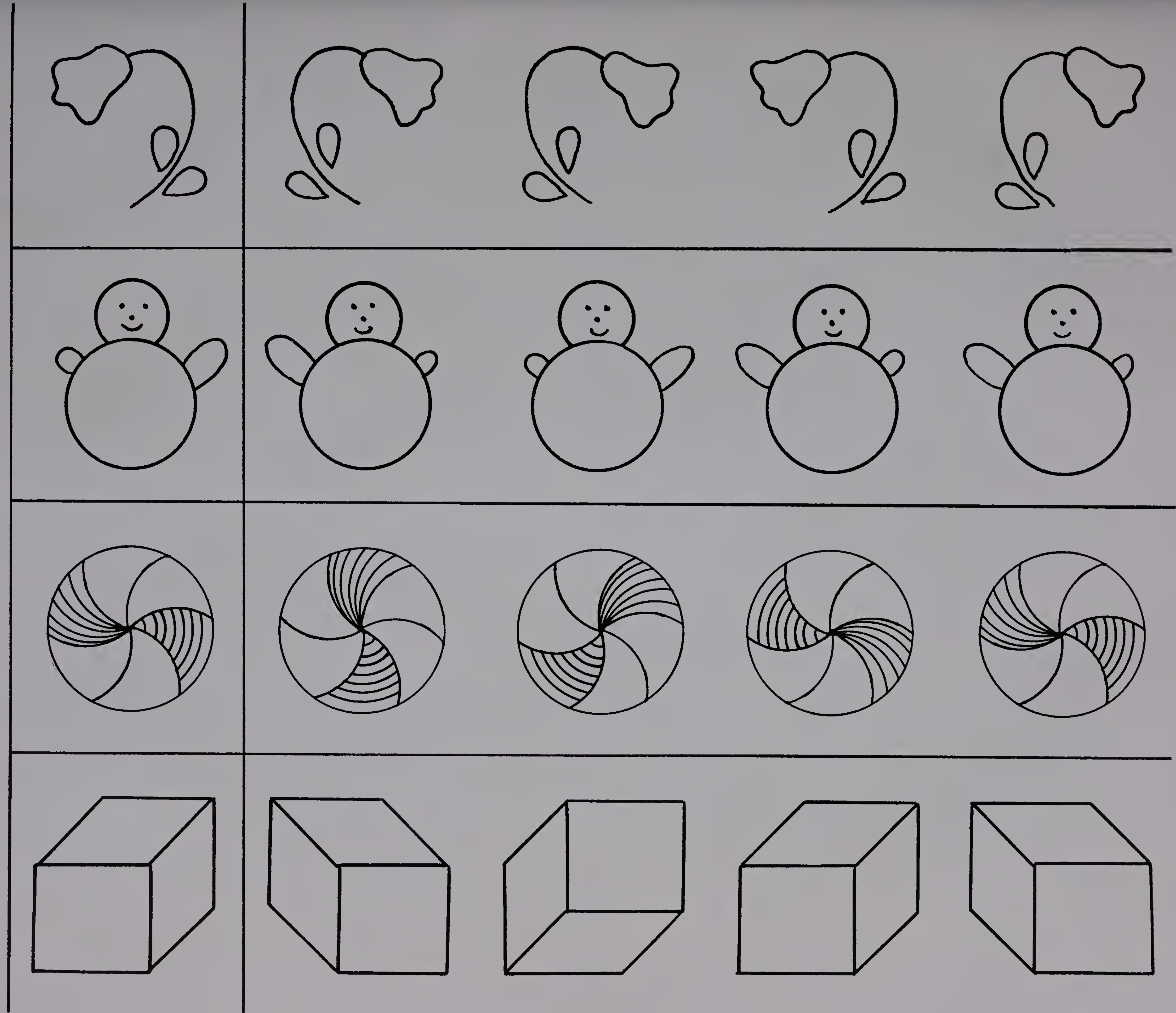
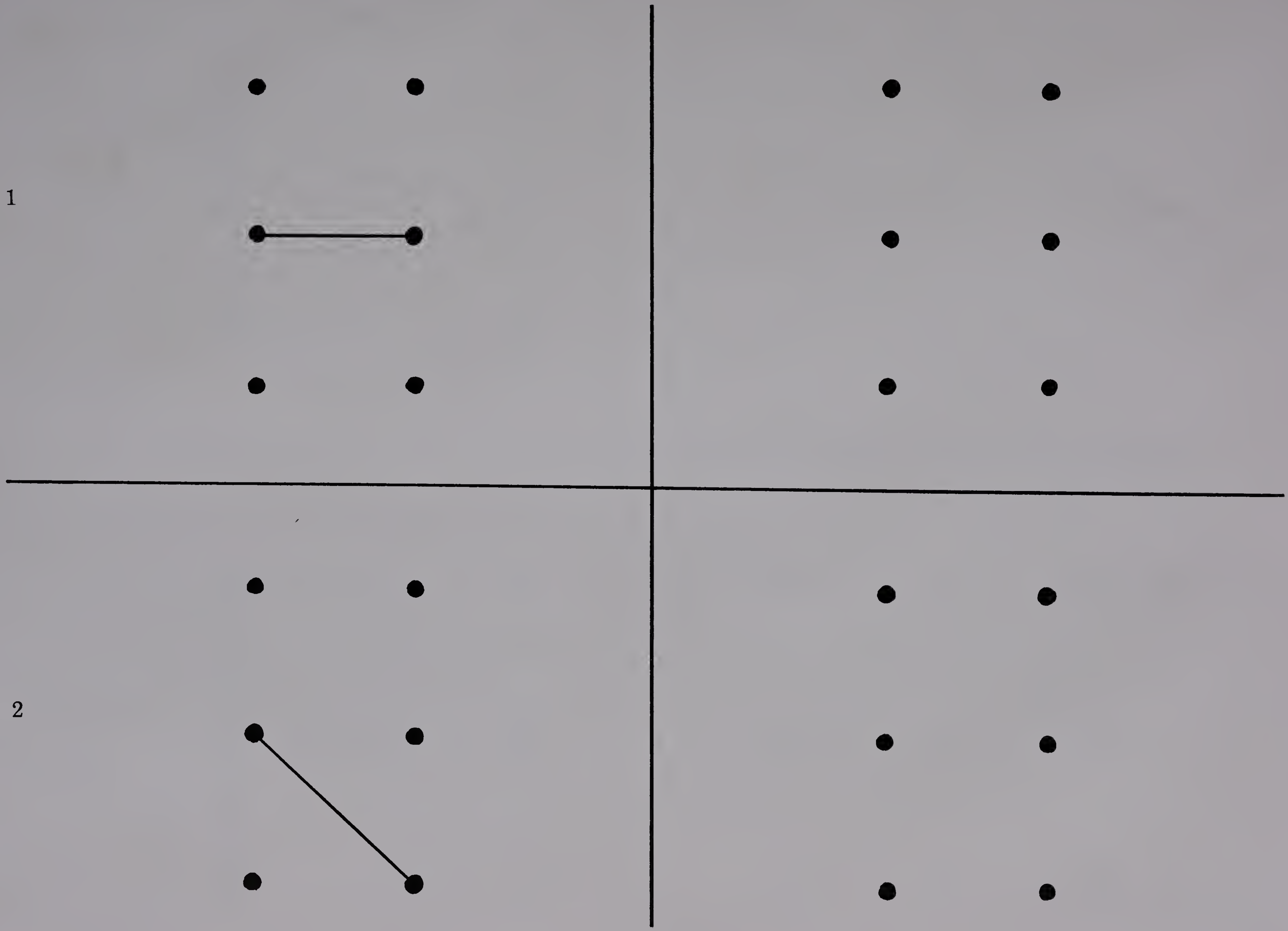


Va



Vb

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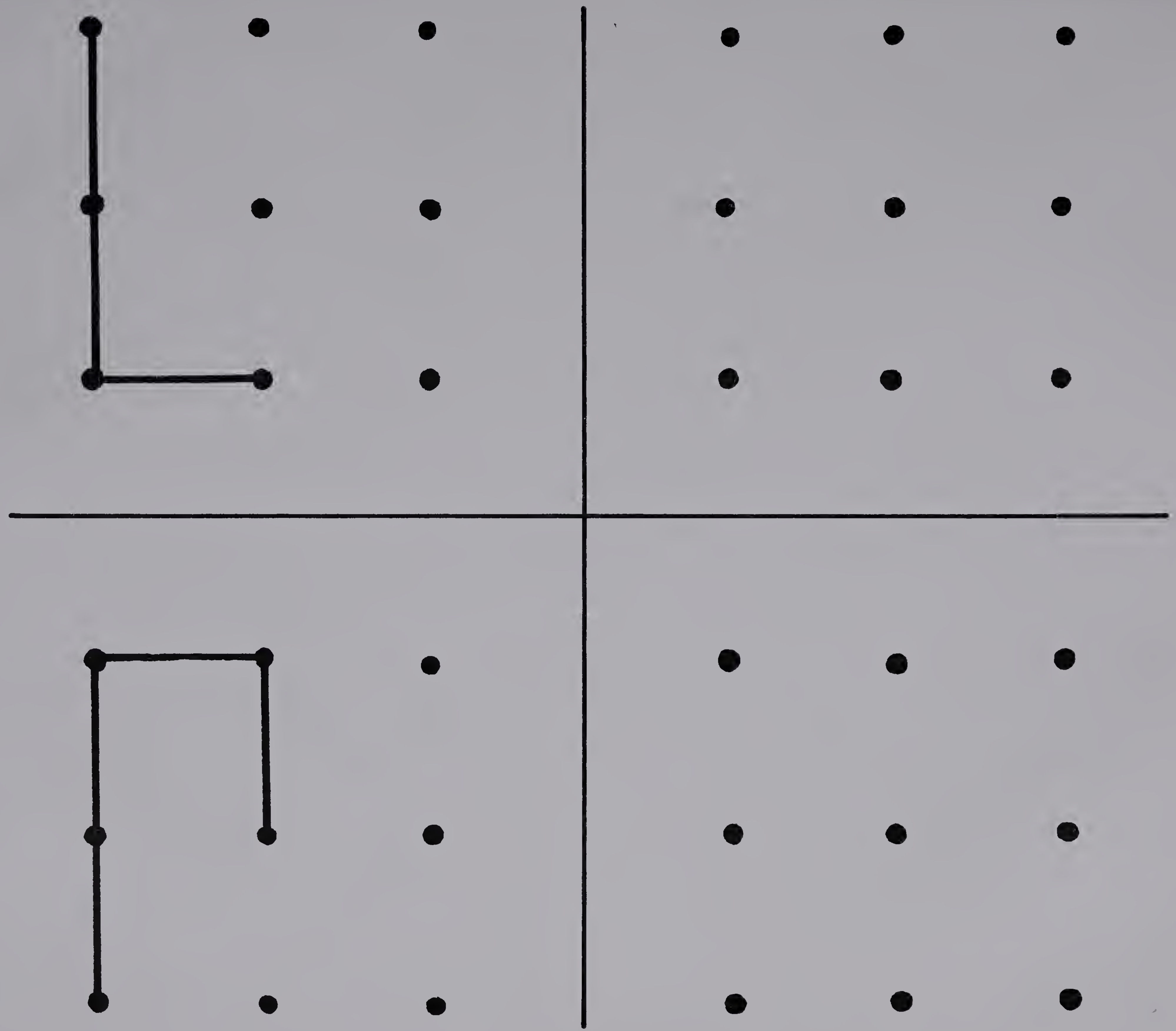
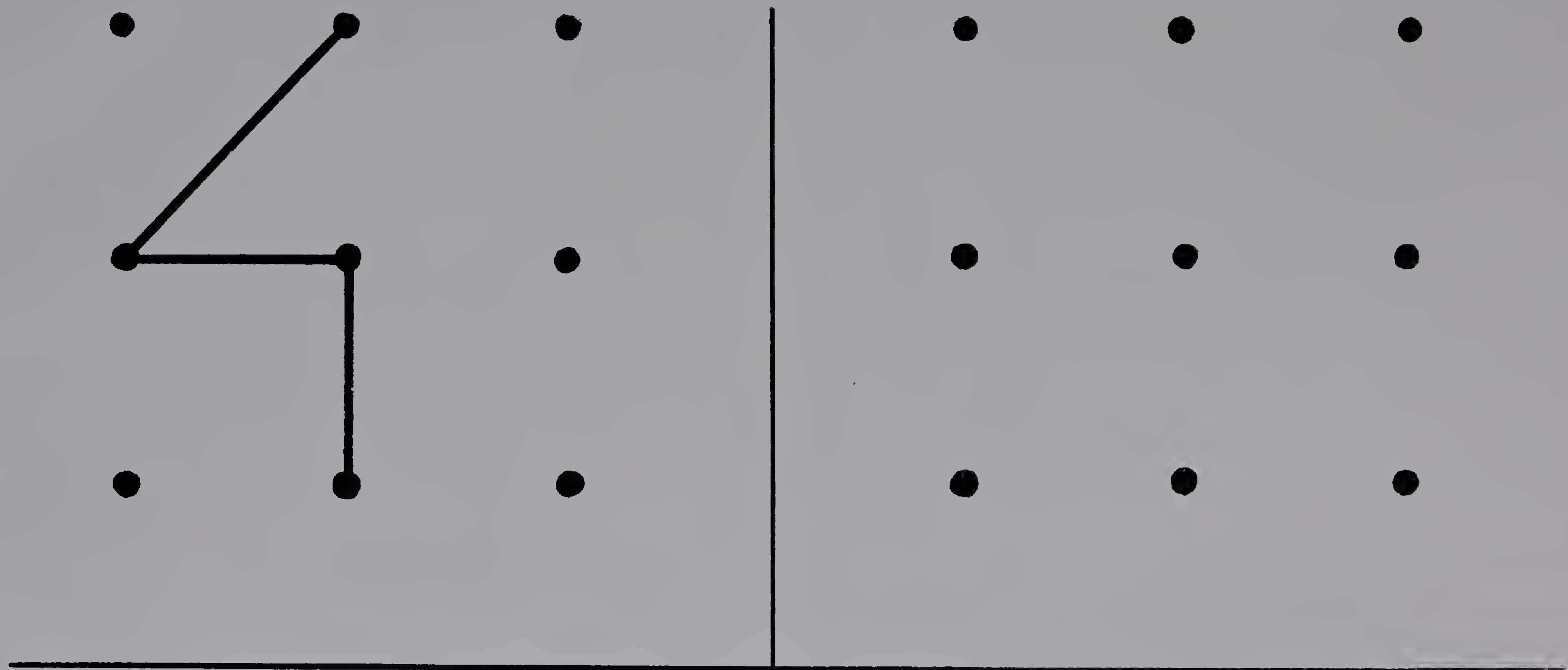


4

Vc

5



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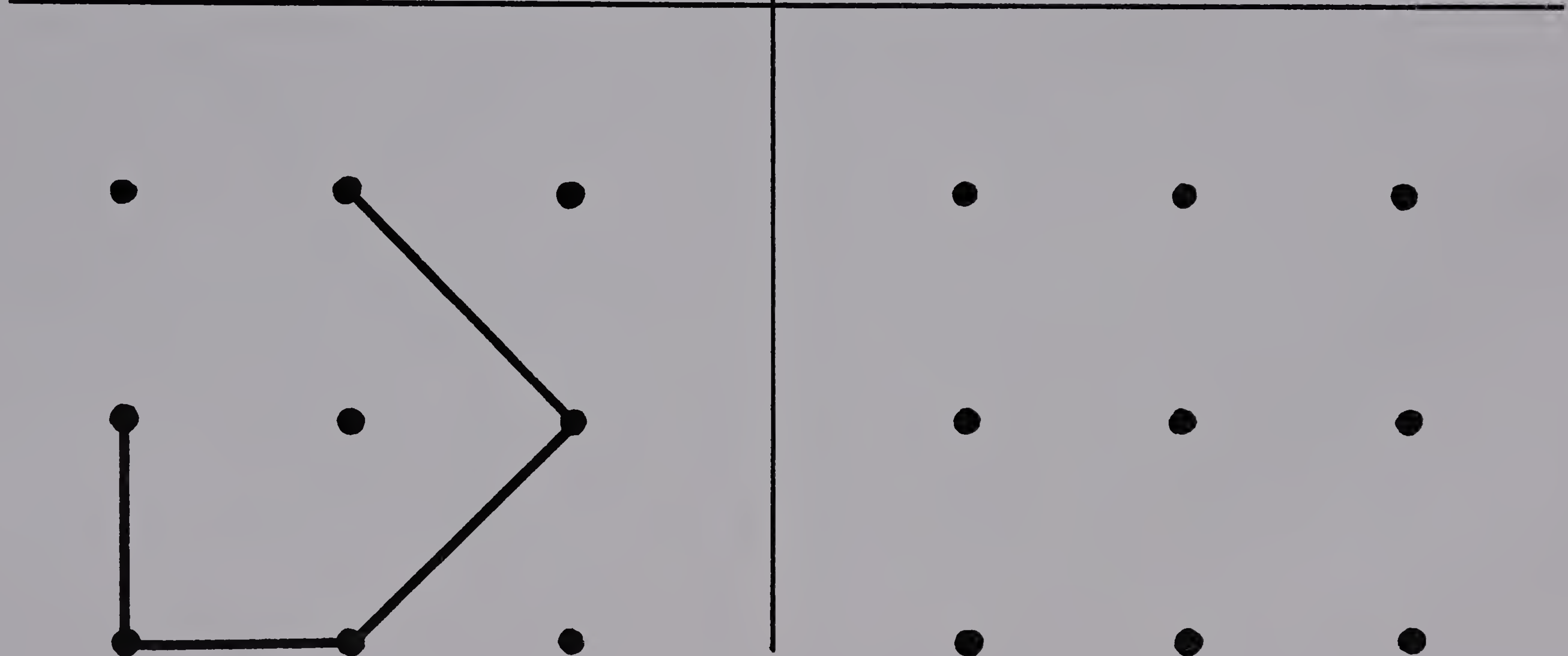
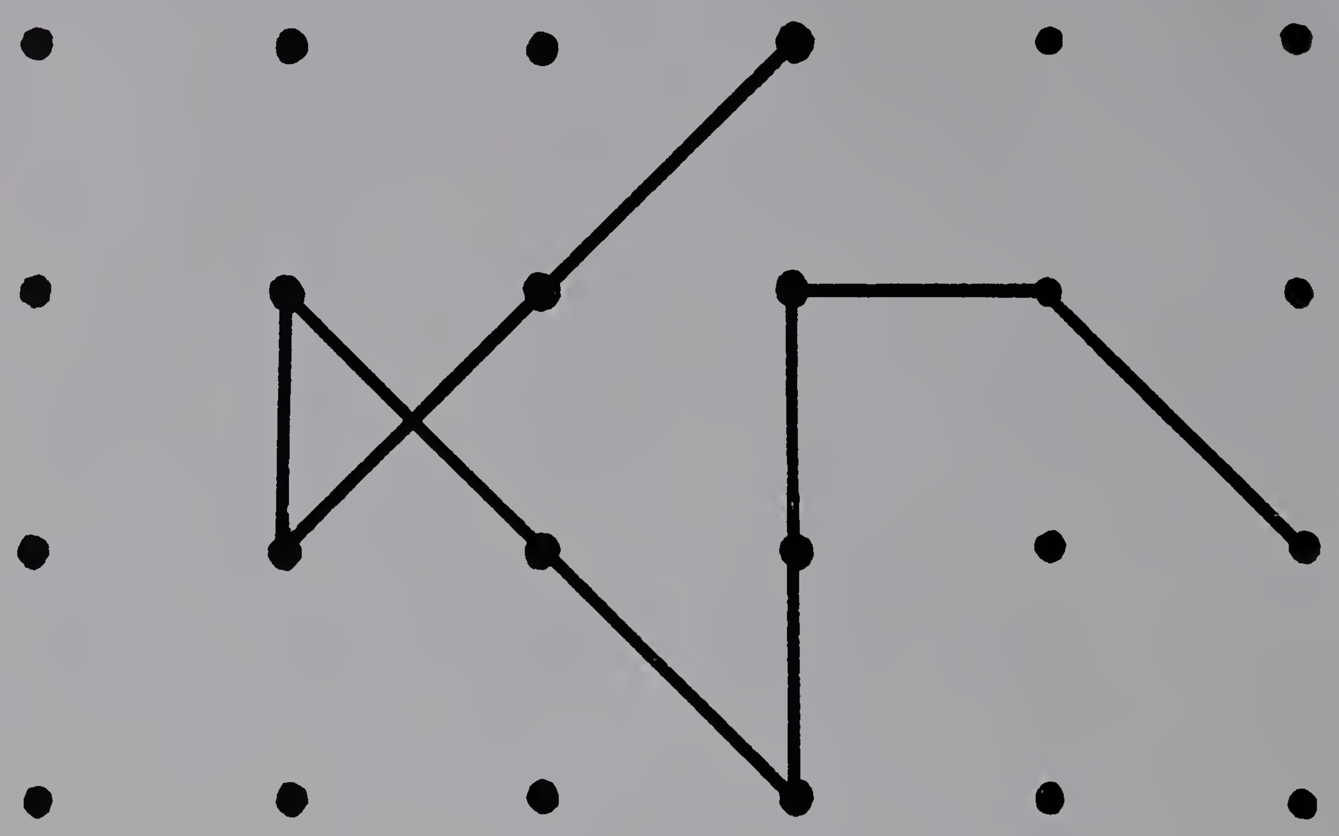


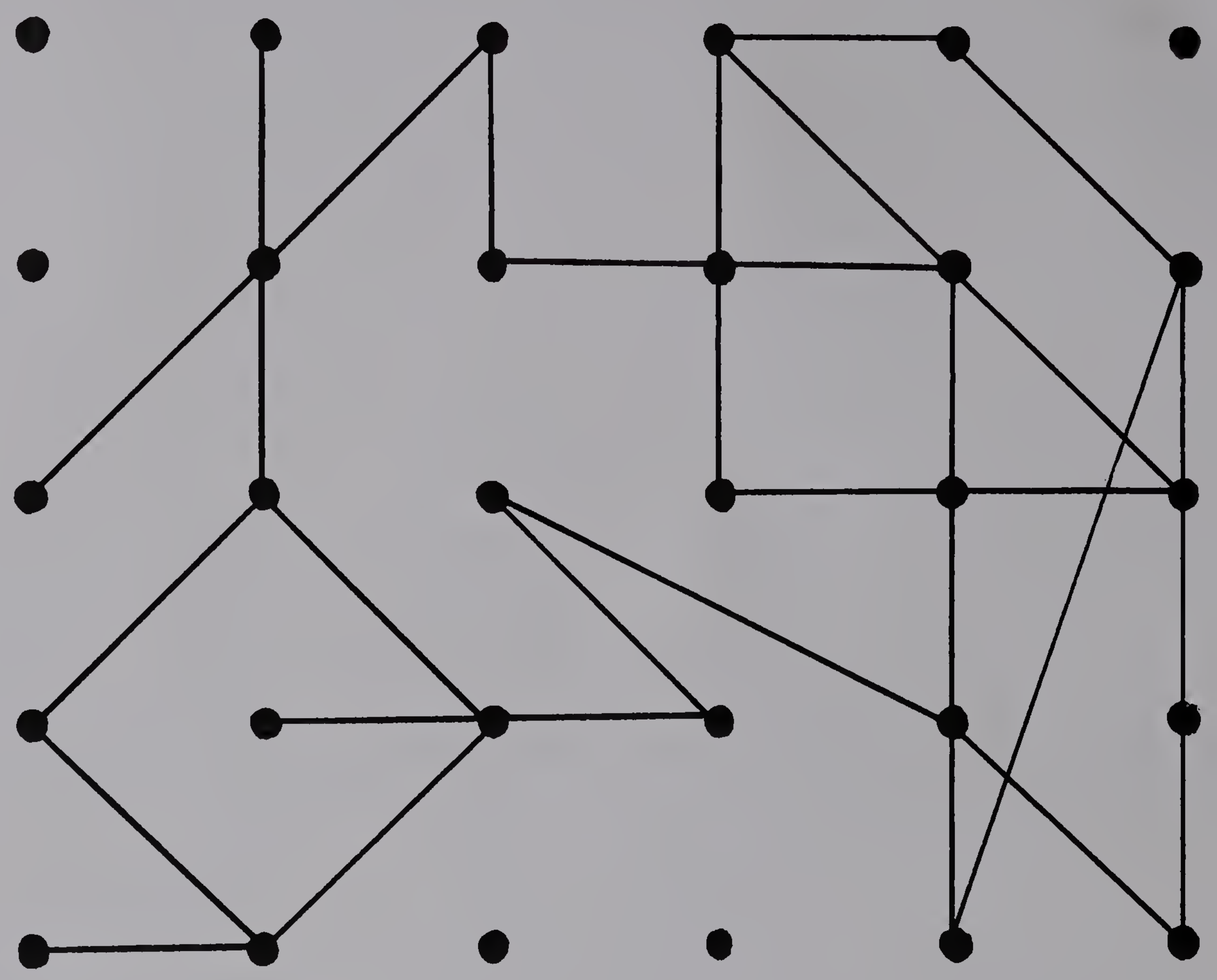
First Grade and up only

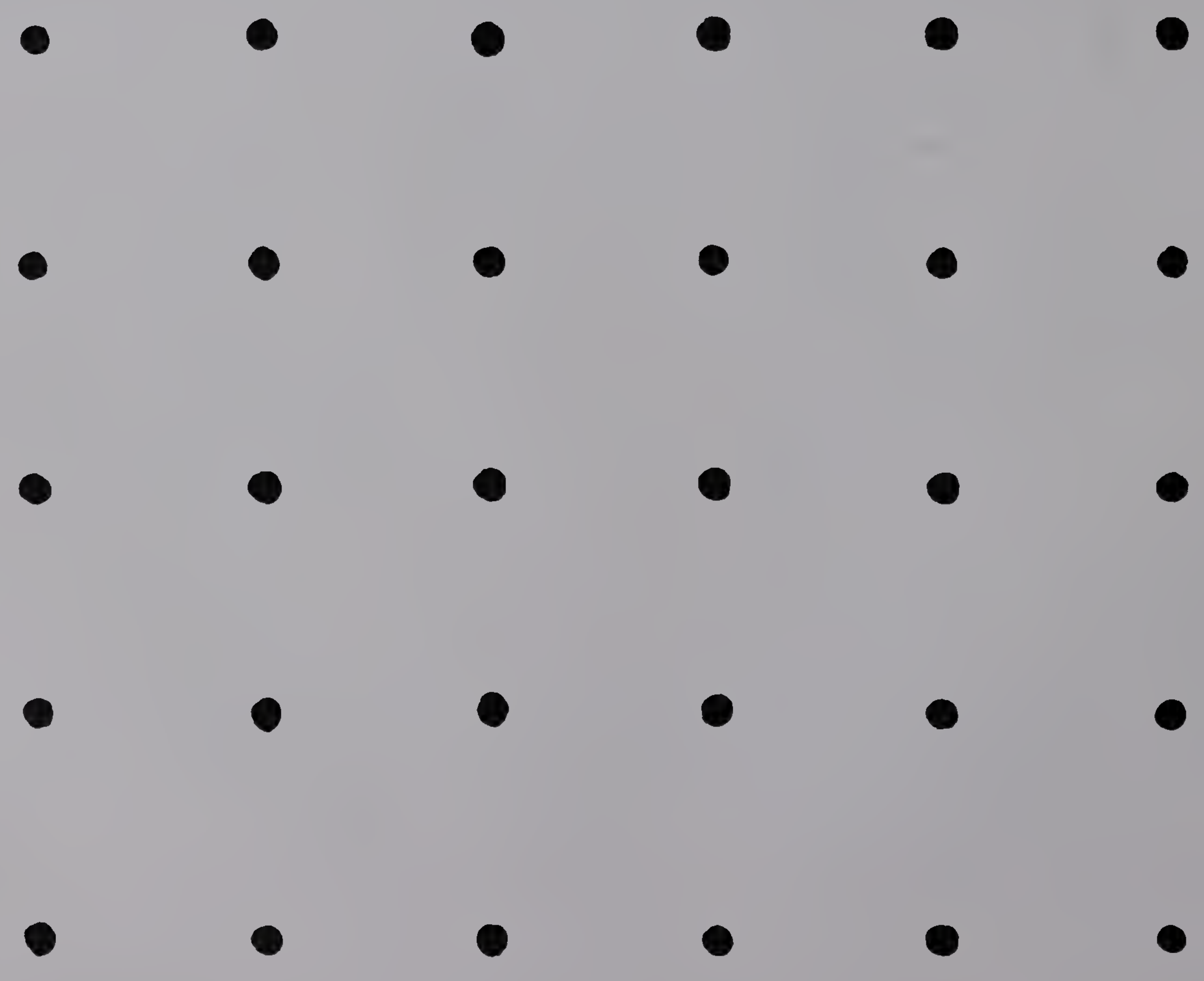
7



First Grade and up only

∞





Notes and Comments

MARIANNE FROSTIG

DEVELOPMENTAL TEST OF VISUAL PERCEPTION

Child's Name . . . .

Parent's Name . . . .

Address . . . .

. . . . Telephone . . . .

	Year	Month	Day
Date of Test			
Birth Date			
Chronological Age			

I.Q. . . . . Handedness . . . . Grade . . . .

Social Adjustment . . . .

Reading Achievement . . . .

Medical Diagnosis if Available . . . .

. . . .

Diagnosing Physician and Agency . . . .

. . . . Telephone . . . .

Examiner . . . .

SUBTESTS	I	II	III	IV	V	
RAW SCORES						
AGE EQUIVALENTS						TOTAL
SCALED SCORES						
	PERCEPTUAL QUOTIENT					

I	II	III a	III b	IV	V
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9		9	9		
10		10	10		
11		11	11		
12		12	12		
13		13	13		
14		14	14		
15			15		
16			16		
			17		
			18		
I	II	III		IV	V

Total

AUDITORY DISCRIMINATION TEST

FORM I

		X	Y
1.	tub - tug		
2.	lack - lack		
3.	web - wed		
4.	leg - led		
5.	chap - chap		
6.	gum - dumb		
7.	bale - gale		
8.	sought - fought		
9.	vow - thou		
10.	shake - shape		
11.	zest - zest		
12.	wretch - wretch		
13.	thread - shred		
14.	jam - jam		
15.	bass - bath		
16.	tin - pin		
17.	pat - pack		
18.	dim - din		
19.	coast - toast		
20.	thimble - symbol		

		X	Y
21.	cat - cap		
22.	din - bin		
23.	lath - lash		
24.	bum - bomb		
25.	clōthe - clōve		
26.	moon - noon		
27.	shack - sack		
28.	sheaf - sheath		
29.	king - king		
30.	badge - badge		
31.	pork - cork		
32.	fie - thigh		
33.	shoal - shawl		
34.	tall - tall		
35.	par - par		
36.	pat - pet		
37.	muff - muss		
38.	pose - pose		
39.	lease - leash		
40.	pen - pin		

	X	Y
Error Score	/30	/10

Name of Child:

Date Tested: Examiner's Name:

Age: Date of Birth:

Grade: Name of School:

Disabilities: Hearing:

Reading:

Speaking:

Other:

I.Q.: Test:

Error Score:

	X	Y
Form C	30	10
Form D	30	10

Additional Comments:

NAME____________ GRADE______ SCHOOL____________ ROOM______

A. Ability to concentrate

1	2	3	4	5
Exceptional ability to concentrate on assigned tasks. Never distracted by other children or activities.	Good ability to concentrate. Rarely distracted. Engages in work assigned.	Average ability to concentrate.	Easily distracted. Short attention span.	Cannot concentrate at all. Attention wanders incessantly.

B. Dominance - submissiveness

1	2	3	4	5
Dominates fellow-pupils. Agressive leader. Unable to be a follower.	Likes to be a leader. Can accept responsibility for group.	Average child. Rarely a leader but has ideas of his own.	Always a follower. Quiet and unobtrusive.	Timid, nervous, lacks confidence. Always needs encouragement. Afraid to do things alone.

C. Persistence

1	2	3	4	5
Unusual persistence Rarely leaves a task until it is completed.	More than normal persistence.	Normal persistence.	Poor persistence. Inclined to leave tasks unfinished.	Extremely poor persistence. Leaves tasks begun almost immediately without completing same.
5 - 10% of class (1 to 3 pupils)	10 - 30% of class (3 to 8 pupils)	40 - 50% of class (12 to 15 pupils)	10 - 30% of class (3 to 8 pupils)	5 - 10% of class (1 to 3 pupils)

PLEASE CIRCLE APPROPRIATE NUMBER FOR EACH OF THE THREE QUALITIES.